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VOLUME XXVI.

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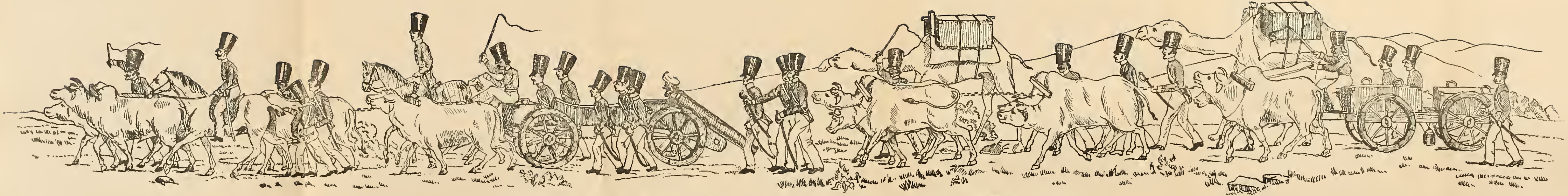

BENGAL FOOT ARTILLERY ON THE MARCH. 1845. *(FROM AN OLD PRINT.)*

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ARTILLERY SERVICE UNDER "JOHN COMPANY."

BY

MAJOR C. N. SIMPSON, R.A.

[So many batteries of the Royal Artillery, had their origin in the Army of the old "Honourable East Indian Company" that I think it probable a brief account of Artillery Service in Bengal, under *John Company*, may prove interesting. No attempt has been made to follow in detail the fortunes of the Bengal Artillery from its first formation until its amalgamation with the Royal Artillery in 1861, all I have endeavoured to do, is to summarize and set forth a few incidents in connection with the Corps and the conditions of service of the time which appear worthy of note.

The recollections of brave deeds, are amongst the greatest treasures an Army can cherish, they foster *esprit de corps*, they appeal to the educated and uneducated alike, and by begetting sympathy with the past create a cohesion in the present, for the interest which binds us to our predecessors binds us also to one another. Such memories are a weapon for discipline which only a soldier can appreciate. The valour which may have been exhibited in former days by our ancestors, lives again in the breasts of their successors, who yearn for the opportunity to prove themselves worthy of the traditions handed down to them by their forefathers.]

IN India up to the year 1748, the few pieces of ordnance used on land were manned by European sailors. The men told off for Artillery duties were called the "gun-room" crew and the officer or petty officer in command, the "Gunner" or "Gunner's mate." On the 17th June, 1747, however, the Court of Directors of the "Honourable East India Company" issued orders for the formation of a company of Artillery in each of the three Presidencies. This order was carried out in the following year, and the company then formed in the Bengal Presidency was the foundation of the Bengal Artillery. In September, 1758, a second company was added to the Bengal Artillery, and its establishment was further increased by a third company, on the 17th September, 1763.

1765. In 1765, the Governor-General, Lord Clive returned from England and the Indian Army was remodelled. The Bengal Artillery by an order dated the 4th August, 1765, was formed into four companies. The present No. 6 Company, E.D.R.A., was the newly formed fourth company. Captain Nathaniel Kindersley was appointed to the command of it, and it was allotted to the 3rd Brigade, commanded by Colonel Sir Robert Barker, its head-quarters being at Bankipur near Patna.

The establishment of the company was as follows :—

1 Captain.
1 Captain-Lieutenant.
1 First Lieutenant.
1 Second Lieutenant.
3 Lieut.-Fireworkers.
4 Sergeants.
4 Corporals.
2 Drummers.
2 Fifers.
10 Bombardiers.
20 Gunners.
60 Matrosses.

Total 7 Officers and 102 N.C.O.'s and men.

The Effective Staff of a company consisted of 1 Adjutant, 1 Quarter-Master, 1 Surgeon's Mate, 1 Deputy Commissary and 2 Conductors ; the Non-Effective Staff of 1 Sergeant-Major, 1 Quarter-Master-Sergeant, 1 Pay Sergeant, 1 Drill Sergeant, 1 Park Sergeant with 3 camp colour-men, and 1 Bullock Sergeant.

The "Matross" was the equivalent of the present Gunner, the term is derived from the German and takes us back to the times when sailors performed the duties of Artillerymen.

A large but indefinite number of Lascars was attached, to assist in working the guns belonging to the company, and the field-pieces attached to each battalion of infantry, which consisted generally of two 3-pounders. A couple of European Artillerymen, belonging to one of the companies, were also attached to these battalion gun details.

The ordnance with a company appears to have consisted of six light 6-pounders and two howitzers, 5½″ probably, forming a battery or "Field-Train" as it was then termed of eight pieces.

Heavy guns and mortars were kept in store at the head-quarters of the brigade, and supplied to the extent available and required for any particular service.

In the earlier stage of its existence, service in the Artillery being neither so lucrative, nor offering so good prospects of advancement as the infantry, it is not surprising to hear that considerable difficulty was experienced in obtaining suitable candidates. Accordingly we find that in the select committee's letter of the 30th September, 1765, to the Court of Directors, it is stated that "it would be of the utmost benefit to our plan that you should send out every year six or seven gentlemen from the Academy at Woolwich for Artillery officers, this being a service that suffers extremely for want of persons properly instructed in their business, since no officer who knows the benefit of the infantry service here, will choose to quit it for any advantages the Artillery affords."

1766. In this year the alarming mutiny, known as the "Batta Mutiny," broke out among the officers of the army, on account of the reduction of their allowances, and was only surpressed by the firmness and decision of Lord Clive. Of the part taken in this business, by Artillery officers, little but the names of the offenders is known. Captain-Lieutenant Patrick Duff, First Lieutenant William Mason, and Lieutenant-Fireworkers Thomas McDonald and Charles Scott, all belonging to the 4th company were implicated in the proceedings. Duff seems to have been most prominent owing to a quarrel between him and the Adjutant of the 3rd Infantry battalion at Bankipur.* He was placed under arrest by Sir Robert Barker and sent to Calcutta pending the decision of Lord Clive on his case but was shortly after released. The other officers resigned their commissions on the 1st May, 1766, but were subsequently re-admitted to the service and placed in the positions they would have held had they remained in it.

1767. On the 1st April, 1767, Captain Kindersley under whose superintendence the 4th company was first formed, was promoted Major. He gained his Lieutenant-Colonelcy on the 28th July, 1769, and was given the command of the Regiment. He did not hold it however, very long, as he died on the 24th October, 1769.

On the death of Lieut.-Colonel Kindersley, Lieut.-Colonel T. D. Pearse, who had been specially sent out from Woolwich for the purpose, succeeded to the command of the corps, which he held for twenty years. His first impressions were apparently not very favourable, for in a letter written to a friend shortly after he had taken over the command, he says "I was astonished at the ignorance of all who composed it. It was a common practice to make any midshipman (who was discontented with the Indian ships) an officer of Artillery, from a strange idea that a knowledge of navigation would perfect an officer of that corps in the knowledge of artillery. They were almost all of this class, and their ideas consonant to the elegant military education they had received. But, thank God! I have got rid of them all but seven."

1769. From this period dates a new era for the Artillery. Lieut.-Colonel Pearse set himself at once to improve its condition, which by his energy and firmness he succeeded in doing, in spite of innumerable obstacles and much vexatious opposition.

1770. In the early part of 1770, the regiment was reorganized. On the 4th March, a fifth company was raised, and in May, the five companies were formed into a battalion, to which an Adjutant was allowed.

The Lascars were told off into divisions of 100 men with two Serangs and eight Tindals; five such divisions being intended for each company of Artillery, but as the garrison company in Fort William did not require so many, the greater number of the Lascar details were distributed among the rest.

The Lascars were at first entertained to work with the drag-ropes in manœuvring or bringing the guns into action, and to carry ammunition, as well as to perform the lesser duties pertaining to ordnance.†

---

* The quarrel arose in the Mess in the 3rd Infantry battalion one evening after mess. In order to compel the authorities to cancel the order for the reduction of Batta, all the officers joining in the meeting decided to resign their commissions on the same day. The Adjutant of the 3rd battalion refused to hand over his commission to Duff. High words followed, and Duff endeavoured to take it by force, a scuffle ensued, the lights were knocked over and the bungalow was set on fire. The flames spread to the adjoining bungalows which were straw thatched buildings and nearly half of the Cantonment was burnt down.

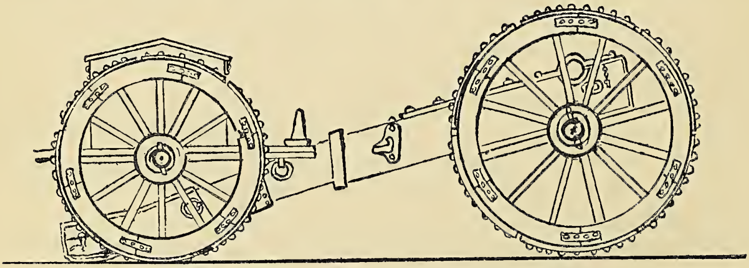
† Such as carrying the linstock with match.

The usual number for exercise and on service was two Tindals and twenty-eight Lascars, for a 12-pounder brass field piece, and half that number for smaller calibres. They were a most efficient and useful body, a class on whom, perhaps, more of the hard work of the service and fewer of its substantial rewards have fallen than any other of the native army. Accompanying the European Artillery at all times, they took part in every expedition and campaign whether in or out of India.

Owing to the absence of records of drawings it is almost impossible to trace the exact nature of the matériel and equipment in the earlier stages of the corps but as far as one can make out, they must have been about as bad as possible. Colonel Pearse writing to Colonel Pattison and General Desaguiliers comments as follows :—"You ask "me about iron guns, we have a great many here, I know not where "they were cast, but I know they are very indifferent. Two 12-pounders "burst on the ramparts in 1770, in firing the morning and evening gun, "and one 12-pounder burst on a rejoicing day in firing salutes. It "destroyed seven Europeans and fourteen or fifteen natives. I excommunicated these iron guns, and substituted brass ones for salutes, and I "proved those of the iron guns which were to be used. They would not "bear 9 lbs. of Europe powder, they stood 7 lbs. only, one out of thirty "burst with 8 lbs. only, and three out of five burst with 9 lb.

"At practice in 1770, the fuzes burnt from 19 to 48 seconds though "of the same nature, the portfires were continually going out, the tubes "would not burn, the powder was infamous, the cartridges were made "conical, and when necessary to prime the gun with loose powder, a "quantity was required to fill the vacant cavity round the cartridge, "the carriages flew to pieces with common firing in a week."

The carriages referred to were probably of a double cheek pattern and were undoubtedly very fragile and constantly breaking down.



Gun Carriage and Limber, 1770.

In 1770, it is believed that on the recommendation of Colonel Pearse the carriage then in use in England was introduced, its limber being altered for bullock draft. It was clumsy even for those days, and certainly ugly, and with its wooden axle not very strong, but doubtless it was an improvement on the old one.

Now as regards the transport of ammunition. The earliest record we have shew us Clive carrying his ammunition on Lascar's heads, their fidelity and steadiness ensured by a detachment of Europeans with their muskets, in the rear to shoot deserters. As this plan was only suitable when the distance to be traversed was very small, tumbrils were introduced; large and unwieldy affairs requiring many bullocks to draw them.

In 1793, they were condemned as being too high, too heavy and liable to overturn. Also owing to the absence of partitions the ammunition in them was liable to get shaken and broken when moving over rough ground. This is not to be wondered at, for at this time serge had not been introduced, and the cartridges were made of paper. The carriage which superseded the old tumbril was subdivided for the reception of ammunition, and capable of holding ninety rounds of 12-pounder ammunition or 150 rounds of 6-pounder. The box was easily removable and fitted with a seat in front for the driver and his bundle.

Various other forms of ammunition waggons were tried from time to time, and in 1823 an ammunition waggon very similar to the modern pattern was introduced. This carriage was provided with a limber exactly similar to that of the gun, and the ammunition was divided into six boxes two on the limber and four on the body of the carriage.

It may be convenient at this point to describe the different modes of draft adopted at various periods in the Foot Artillery. When the Company was first formed (as has been already stated), the guns were dragged by Lascars, twenty-eight Lascars and two Serangs being the usual proportion for each gun (12-pr.).

In 1779, the necessity of a train of draught bullocks for the Artillery, was pressed on the Government by Sir Eyre Coote, and 4,000 were directed to be kept at certain stations for this purpose; they were to be from four to six years old, and 50 inches high. The number allowed for each carriage was as follows:—

24-pounder gun	12 pairs.	8-inch. Howitzer	7 pairs.
18 ,, ,,	9 ,,	5½ ,, ,,	5 ,,
12 ,, ,,	6 ,,	4½ ,, ,,	3 ,,
6 ,, ,,	3 ,,	Wagon	7 ,,
3 ,, ,,	2 ,,	Tumbril	5 ,,

Up to 1818, bullocks were the only draught animals used in the Foot Artillery, they were attached to the carriages by yokes and traces made of raw hide, these latter during Lord Cornwallis's campaigns being superseded by draught chains.

In 1818, a 12-pounder battery was horsed with a limited number of inferior animals, and so successful did the experiment prove, in spite of the indifferent material, that it was decided that all batteries should be horsed. On a change of government, however, in 1828 the horses were ordered to be sold and their places taken by bullocks again.

In 1841, orders were received from the Court of Directors, to replace the bullocks by camels and elephants. As the great bulk of the latter made them an easy target for an enemy, it was decided that they were never to be exposed to fire, and a certain number of spare limbers with teams of bullocks were provided to take the guns into action.

1770. The uniform of the Regiment at this time, consisted of a blue coat faced with scarlet, and cut away in the fashion of the time, white cloth waistcoat and breeches with buckles at the knees, and gaiters or half spatterdashes, as they were called, a red leather belt with swivels, black silk stock, and buff gloves. The Regimental hat is supposed to have been a plain cocked, in the fashion of George the Second's time. The hair was worn greased, powdered and twisted into a queue, false hair being substituted when the natural was not long enough.

1775. In 1775, the establishment of Lascars was reduced to two Serangs, four Tindals, and 100 men per company in cantonments, the remainder being transferred to the magazines, from which on active service the company details were to be increased to four Serangs, twelve Tindals, and 325 men.

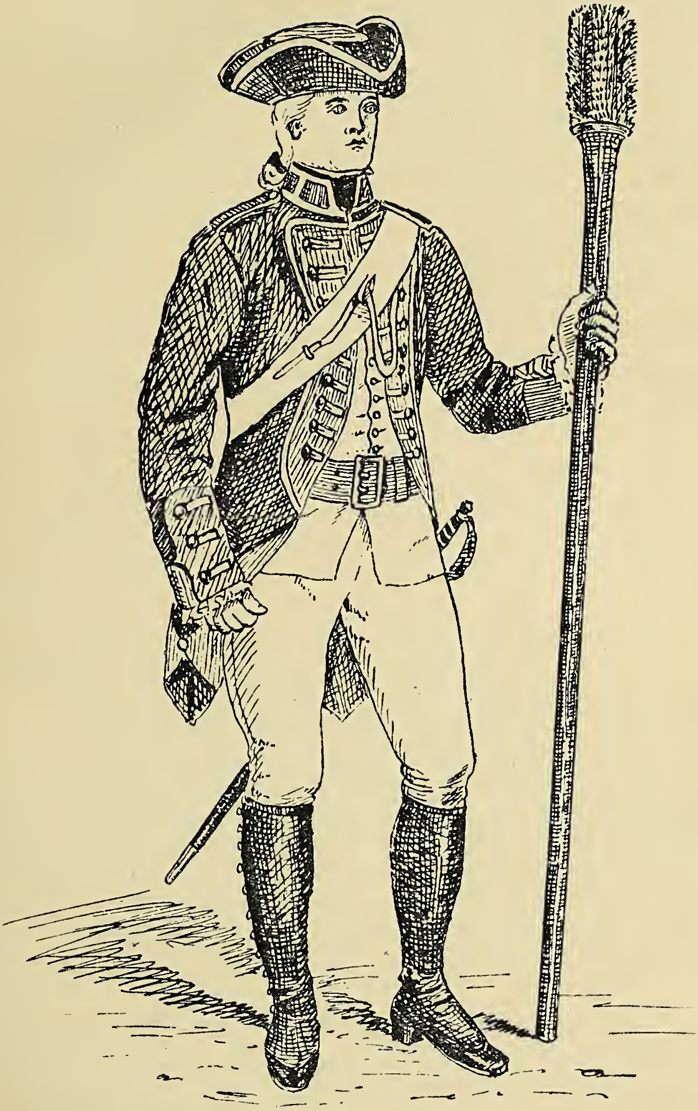
1776. The climate of Calcutta, the head-quarters of the Regiment at this period, does not appear to have been particularly salubrious. Colonel Pearse writing to his uncle Admiral Mann, alludes to it, as follows :—" The air of Calcutta is in summer like a hot steam " room, and in winter like a cold steam house. All the air is, in every " season, full of moisture and saltpetre."

The manners and habits of the period, were somewhat peculiar as compared with modern days. The hours for parades, and in fact for everything were early, parades were before gun-fire in the cold season, while dinners were in the middle of the day, not only in private houses, but on public occasions; and invitations were given on a scale of hospitality only practicable in a small society. The order-book was the common channel of invitation used by the Governor-General and the officer commanding the garrison. Many such entries as the following will be found in it :—"The Honourable the Governor-General, " requests to be favoured with the company of officers and gentlemen " belonging to the army now in the garrison of Fort William and the " presidency, on Monday next, to dinner at the Court house, and in the " evening to a Ball and supper. The Governor-General requests that " gentlemen will not bring any servants to dinner, nor their hookahs to " the Ball at night."

Or " Lieut.-Colonel Wilding presents his compliments to all the " officers in Fort William, the staff of the garrison, and surgeons, and " requests their company to breakfast, and dinner, at half-past two " o'clock."

In December the company marched into camp at Dum Dum for practice. Dum Dum was first used as an Artillery practice ground the previous year, but all the available camp equipage being required for the use of a brigade marching to Dinapore, the companies were ordered back to Fort William and their practice cut short to one fortnight, instead of two months. This year however—as the orders record—they marched out with their tents and stores and began the practice by firing a Royal salute, and after that one of nineteen guns for the company.

The practice ground was obtained from the Brahmins of some temples in Calcutta (in exchange for other lands east of the salt-water lake), who afterwards laid claim to it, and appear to have abstracted the documents proving the purchase from the Magistrate's office while



MATROSS, BENGAL ARTILLERY,
1770.

the case was pending.

During the practice season, the officers inhabited a large building standing on a raised mound, known as Dum Dum House. The men's tents were pitched in the compound, and the natives' in the "Montague Lines," on the ground now occupied by the Nya Bazaar, called after Lieutenant Montague, the Adjutant who marked them out.

1777. In March 1777, the 4th Company was inspected twice, first by the Governor-General, Warren Hastings, and then by the Commander-in-Chief, General Clavering. The Governor who was excessively pleased, published an order, thanking all concerned, for their good performance. The General, though he only formally and coldly thanked the Commandant (whom he cordially disliked)—said afterwards, that he had reviewed most of the King's Regiments, but had never seen any perform better. Colonel Pearse, the Commandant speaking of this inspection says :—"Not one circumstance had I to "lessen the pleasure I received from the good performance of my Corps, "as a battalion of infantry, as a battalion of Artillery with sixteen can-"nons, and a body of Artillery on service in their batteries; for we "went through all these exercises equally well."

1778. In 1778, a reorganization of the Artillery was ordered, in which Golundaz or native companies took a considerable part. Hitherto, as want dictated, company after company had been added to the establishment, but the Artillery was now formed into an independent brigade of one European Regiment and three native battalions.

The European consisted of seven Field and one mounted or Garrison company. The Lascars were all reduced.

1779. The new organization was not destined to remain long in force, for in March, 1779, General Sir Eyre Coote arrived from England, to succeed the late General Clavering as Commander-in-Chief, and shortly afterwards it was announced that he had brought authority to disband the Golundaz. Economical and advantageous to the public service as the system of employing native artilleryman was, alarm was taken by the Court of Directors and the home Government, at the supposed danger of teaching the natives the art of gunnery, and by Minutes of Council dated November 23rd, 1779, issued in accordance with instructions from Leadenhall Street, the Golundaz were ordered to be disbanded.

In the reorganization of the Corps, consequent on these changes, it was formed into two European battalions of five companies each, and to each company was attached a battalion of Lascars of six companies, numbering 330 of all ranks. They were to be instructed in and to perform all the usual services of artillery, with the exception of loading and pointing guns and mortars. They were clad in a uniform consisting of 'angas' or short tunics, padded with cotton according to the weather, jangiyas or short white drawers, and turbans, and armed with a light pike so constructed as to form *Chevaux-de-frise* if necessary.

The establishment of a *Company* as now settled was:—

1 Captain.
1 Captain-Lieutenant.
3 Lieutenants.
3 Lieut.-Fireworkers.
6 Sergeants.
6 Corporals.
3 Drummers.
8 Bombardiers.
24 Gunners.
53 Matrosses.

Total 8 Officers and 100 N.C.O.'s and men.

1785. In 1785, the designation of *the Companies*, was again changed.

1786. On the 30th January 1786, it was resolved in Council to incorporate the two battalions of Artillery, into one of ten companies; the establishment of officers and N.C.O.'s however was to remain unaltered until vacancies and casualties had reduced it to the necessary numbers.

In making these arrangements, the original numbering was restored, it turned out however, that as was the case in 1779, the Home authorities had entered upon the subject of organization, at the same time as the Indian, and in consequence, the above arrangement was hardly completed, when in May 1786, distinct orders for the reorganization of the whole army were received from Home. Accordingly we find, that the Minutes of Council dated the 2nd of June, direct the formation of the Artillery into a regiment of three battalions, each composed of five companies; each company to consist of 1 Captain, 2 Lieutenants, 2 Lieut.-Fireworkers, 4 Sergeants, 4 Corporals, 8 Gunners, 2 Drummers and 56 Matrosses. Two companies of Lascars were assigned to each company each having 1 Serang, 2 first Tindals, 2 second Tindals, 56 Lascars and 1 Puckalie.

1787. Although so recent, the organization just described was soon modified, for on the 1st May 1787, the Artillery was constituted one of the Brigades of the Army and a Brigade-Major appointed to it, but strange to say he was an Infantry officer.

Education in the ranks at this time was very defective, and the subject had long occupied Colonel Pearse's attention. Under his orders a Regimental school had been established in 1778, and in 1787 he again referred to the matter in Regimental orders in the following terms:—"Colonel Pearse having the welfare of his soldiers at heart, "has thought proper to establish a school for their instruction, that by "teaching them to read, he may enable them to learn their duty as "Christians, from the books of their religion, and as soldiers, from the "orders and regulations laid down for their guidance."

To induce Non-commissioned officers to qualify themselves for their position, he directs, that every Sergeant employing a man to write and read for him, shall pay him six rupees a month, or to write for him four rupees a month, and he shall not read on parade or be excused his duties. The number allowed to attend school from each company was limited, and the order remained so nominally for many years, although as a matter of fact none wishing for instruction were ever refused.

1788. On the 4th of September 1788, a G.O. was issued which directed that the companies of Artillery were to receive permanent numbers. Colonel Pearse therefore examined all the records of the Corps as far back as 1770, and ascertained the exact seniority of each. Hitherto the companies had been numbered according to the seniority of their Captains, or the order for field duty, which led to frequent and inconvenient changes, for instance, on the promotion of a captain to a majority, his company would be given to the captain just promoted, and the company would be moved from the first to the last in the battalion.

1789. This year the regiment sustained a loss which was well nigh irreparable. On the night of the 9th of March 1789, a fire broke out in the arsenal at Fort William, and the workshops with a quantity of stores were consumed. Colonel Pearse was present, but his health was not good (it appears he was undergoing a course of mercury, in those days considered a specific for many diseases), and the exposure to the night air, and the exertions he underwent, probably accelerated his end. More than twenty years of unceasing exertion and much anxiety, had done their work on his constitution, and he died on 15th June, at the early age of 47, leaving a name which will always be loved and respected as long as the Regiment of which he was so justly proud, shall be remembered. He was buried in South Park Street Cemetery, Calcutta, and a handsome monument was raised to his memory at Dum Dum, by his brother officers.

The command of the Artillery Brigade, now devolved on Lieutenant-Colonel George Deare, who had been hitherto commanding the 1st battalion at Cawnpore.

1790. In 1790, whilst some companies of Bengal Artillery were serving in Madras, a dispute arose as to the precedence of the Bengal Artillery when parading with the King's Infantry. The matter was referred to Head-quarters for a decision and Major-General Meadows, Commander-in-Chief of Madras, ruled that "His Majesty's" cavalry takes precedence of the company's cavalry, and "His Majesty's" infantry of the company's infantry, and "His Majesty's" artillery of the company's artillery, but the artillery takes precedence of the infantry, without considering the service to which they belong. "This was followed up by a G.O. from Lord Cornwallis, dated, 1st June 1790, directing that Bengal troops were always to take the right of those belonging to either of the other Presidencies, but the latter were to have precedence each in their own Presidency, drawing lots on neutral ground."

1793. Siege of Pondichery. In June 1793, hostilities with France induced us to fit out an expedition against the French Settlement Pondichery, on the coast of Coromandel. The force consisted of the 72nd, 73rd, 74th, and the 3rd European regiments of infantry, and five companies of Artillery.

Colonel Braithwaite was in command of the whole Force, while Major Blake commanded the Artillery portion of it.

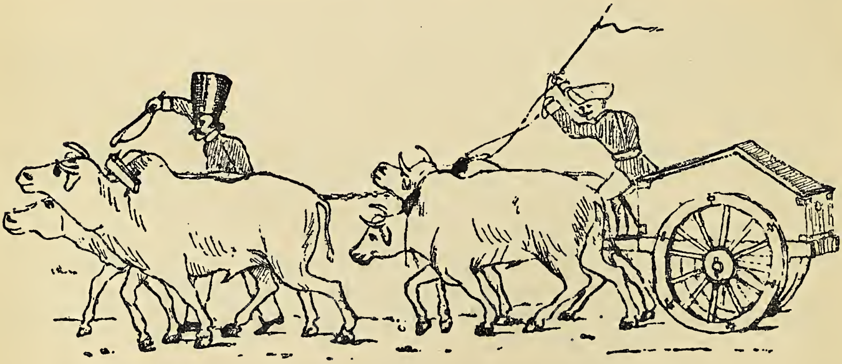
The necessary equipment having been collected, the siege of Pondichery commenced early in August, the troops encamping in a thick wood, where tigers were so numerous that the natives durst not travel at night.

On the 22nd August, a white flag was hoisted by the Garrison with a request to be permitted to surrender. The French soldiers in the Fortress, behaved in the most insubordinate manner. They insisted that the Governor should surrender, but after the white flag was displayed they fired two shells, which killed several men of the 72nd.

During the night they became very intoxicated and were guilty of every species of outrage. In the morning, they surrounded Government House, and threatened to hang the Governor, General Charmont, before his own door, when application was made to the English for assistance. The British soldiers rushed into the town, overpowered the insurgents, rescued the Governor, and saved the inhabitants, from further violence.

This service being completed *the companies* returned to Calcutta in October.

In November of the same year, a detachment was embarked on board Admiral Mitchell's Fleet, for service as Marines, against French Cruisers, in the Bay of Bengal and the Eastern Archipelago. The men were specially selected from the various companies for the service, none but trained men being taken. The detachment which numbered six Officers, ten N.C.O.'s, ninety-eight gunners, and 230 lascars was commanded by Captain Andrew Fraser, and was absent on this duty about a year. Their good conduct and the unanimity which prevailed between them and the crews of the various ships, were eulogized by the Commander-in-Chief in General Orders, on their return.



Ammunition Waggon, 1794. (From an old print.)

1796. This year was a memorable one in the annals of the Indian Army, its constitution having been entirely remodelled, and many advantages granted to it. The Artillery was converted into a regiment of three battalions of five companies each, with thirty companies of lascars attached. The rank of Captain-Lieutenant was restored, as a compensation, for the necessarily slower promotion, in a large, than in a small seniority regiment. The establishment of a company was fixed at 1 Captain, 1 Captain-Lieutenant, 2 Lieutenants, 1 Lieut.-Fireworker, 4 Sergeants, 4 Corporals, 2 Drummers, 8 Gunners, and 56 Matrosses. Total 6 Officers, and 74 N.C.O.'s and men.

On the 8th of June, 1796, a letter was received from the Court of Directors, announcing that in order to prevent officers of the Indian Army being superseded by junior officers of the same grade in the King's service, the Secretary of State had recommended His Majesty to give every officer in the Indian Army a commission bearing the same date as that which he held from the Honourable East Indian Company. Up to this time every officer in the King's service, took precedence of all the Company's officers of the same rank.

A proposal made by Lord Cornwallis to incorporate the Indian with the King's Artillery was held by the officers of the former to be prejudicial to their interests, and likely to augment the mutual discontents which had long existed between the two corps.

1797. An establishment of 74 N.C.O.'s and men, was found to be quite inadequate, especially when a company had to provide outlying detachments, so in 1797, 10 Matrosses were added to each company, the 1st European Regiment supplying drafts for this purpose.

On the 13th March, Major-General P. Duff* arrived from England, and took over the command of the regiment from Major-General Deare. He did not however hold it long, for the following month, he was appointed to command the Presidency, and Colonel Hussy succeeded to the regiment. General Duff appears to have been a man of very powerful physique, and some wonderful anecdotes are told of his feats of strength. On one occasion it is said, he was attacked by a leopard, who sprung suddenly upon him, but seizing the animal by the throat, he never relinquished his grasp, until it was fairly powerless, and easily put an end to. On another occasion finding a sentry over the gun park asleep on his post, he lifted a 6-pr. gun weighing something over 4-cwt. off its carriage and carried it away with him under his arm, like a telescope, "durbeen ke moaffik" his orderly, an old native officer expressed it.

General Duff finally returned home in December.

1798. Lieut.-Colonel Hussy was promoted Major-General in September, 1798, and Lieut.-Colonel C. Green assumed command of the regiment.

About this time the political horizon was everywhere clouded. The Afghans and the Mahrattas, to say nothing of the French and Tippoo, in Mysore, were almost openly hostile, and a further increase to the

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* Note by Secretary R.A.I.
There is a very fine portrait of this officer over the fire-place in the South-West Anteroom, Woolwich Mess; Mr. Morris named it as that of 'Tiger' Duff, this being the nick-name given by the late General Sir George Brooke, Bengal Artillery.

Artillery became imperative. Europeans were not easily obtainable, so the notable expedient was adopted of amalgamating European and Native Artillery together in one company. On the 16th October, 1798, each company was increased by 1 Sergeant, 1 Corporal, 2 Gunners, and 4 Matrosses, and a detail of Golundaz of 1 Jemadar, 3 Havildars, 3 Naicks, and 40 privates. This mixture of natives with Europeans was most injudicious. These details of Golundaz "the component part" as they were officially termed, were to be drilled in the same exercises, and clad in the same uniform as the Europeans, but anything like amalgamation was impossible. The European would have no truck with the native, and diffident of his ability to serve the vent or manage the portfire, he positively refused to stand near the muzzle of the gun, urging in spite of all reasoning that "it was hard to be blown away by a black fellow," while the native on the other hand, suspicious of mischief, refused in his turn, to take the sponge staff or be server, declaring that he might be blown away by the carelessness or design of the European.

The unsettled state of the Great Mahratta Powers already alluded to, and the threatening aspect of Zeman Shah, with whom Vizier Ali, the deposed Nawab of Oude, had been corresponding, rendered it necessary to place an army of observation in the Field on our Northern Frontier. A considerable Force under Sir James Craig was assembled at Anopsheher, with which were five companies under Lieut.-Colonel Woodburn. The Force was very poorly equipped with ammunition, the infantry had only 120, and the cavalry only 40 rounds per man, while the Artillery had only 300 rounds. This state of affairs might have led to a serious disaster, but luckily Zeman Shah retired and no harm occurred.

1801.

In 1801, the affairs of Europe were in a very disturbed state, and the French Emperor was endeavouring to effect the subjection of Portugal as well as Spain, to his power. The Indian authorities therefore deemed it advisable, to fit out a Force, and occupy the Portuguese Settlement of Macau, on the canton river, in China. The 4th *Company* was selected to accompany the Expedition, and embarked in November, 1801, on the East Indiaman *Dover Castle*, the following officers going with it, viz:—Captain Andrew Fraser in command, Lieutenants Hind, G. Fuller and Lieut.-Fireworker C. H. Palmer. The so called Portuguese Garrison of Macau, consisted of only two or three hundred half-starved blacks, who offered no opposition to the landing of the troops, and the local Portuguese authorities making a virtue of a necessity, gave their consent to the British occupation of the town. The Chinese however, who regarded the place as a portion of their own Empire, and the Portuguese as only tenants at will, were most indignant at the proceeding, and by way of retaliation, promptly forbade all British trade with Canton. A good deal of ill feeling was shown by the inhabitants, and affrays and assaults, especially between the Sepoys and Chinese, were of constant occurrence. The *Company* returned to Fort William in the following November, after an absence of just twelve months.

Expedition of Macau.

The Court of Directors were highly incensed at the whole affair, and passed a resolution condemning in severe terms, the conduct of the Committee in proceeding "upon unaccredited rumours, without "any permission of the Government of China or previous communica- "tion with it, to encourage the Bengal Government to send a Military "Force to take possession of Macau."

In 1801, by a G.O. dated October 16th, officers were permitted to wear long uniform coats, and on the line of march, or on regimental duty, a plain Swiss jacket with embroidery, and blue cloth pantaloons. Round hats cocked to be the usual head dress, till replaced by the shako.

1802. In February 1802, an increase of the Bengal Artillery was reluctantly sanctioned by the Home authorities, and two companies were added to each battalion, and the strength of a company raised to 1 Captain, 1 Captain-Lieutenant, 2 Lieutenants, 2 Lieut.-Fireworkers, 5 Sergeants, 5 Corporals, 2 Drummers, 10 Gunners, and 80 Matrosses. The companies were levelled so as to divide the old gunners and matrosses equally amongst them, and the vacancies were filled up as far as possible, by the reduction of the 2nd European Regiment.

1805. In 1805, the command of the regiment again became vacant by the promotion of Colonel Green, who was succeeded by Colonel Nicholas Carnegie, the next senior officer present in India.

1806. On several occasions, when small expeditions were sent out against petty landholders, or other lawless characters, it was found that the light field guns which usually accompanied the infantry were not equal to the task of coping successfully with the mud forts, which everywhere abounded. Accordingly, on the 8th November 1806, a G.O. was issued, directing that whatever fortified places were to be attacked, a proportion of battering pieces was to be taken, and that less than two guns were never to be detached on any service.

1808. In 1808, Colonel Carnegie resigned the command of the Regiment and went home. He was succeeded by Colonel J. Horsford, who, with much credit to himself, had been commanding the Artillery in the field.

In this year some alterations proposed by Colonel Carnegie in the uniform of the Regiment were sanctioned. Plain double-breasted jackets with buttons of a pattern adopted by Lord Lake and epaulettes or wings as before, were ordered. The sword and sword-knot were to be the same as for the infantry, both for mounted and dismounted officers; waist-belts with frogs for mounted officers being discontinued. Crossbelts were worn over the jacket, and over these a sash with the ends tucked in.

1809.
Operations in Bandelkhand.

The province of Bandelkhand, was ceded to the British by the Peshwah by the treaty of Bassein in 1802, but for ten years afterwards, it required the presence of a large force to keep it even under nominal subjection.

The numerous strongholds which existed all over the province, and the lawless spirit of the Bandela chiefs, made them impatient of control, and small expeditions were kept perpetually on the move, reducing the more unruly ones to obedience. Many minor sieges took place, the most important of which were those of Adjighur and Bhawani.

The existing records are so vague that it is impossible to identify the precise units, to which those engaged belonged.

1812. Bandelkhand still continued the seat of war, the military adventurer Gopal Singh, availing himself of the natural fastnesses of the country, defied our authority and evaded our troops, keeping them perpetually on the move. This harassing and desultory warfare was only brought to a close by the siege of Kalinjar in February 1812, after which Gopal Singh returned to his allegiance.

Siege of Kalinjar. Kalinjar is a fort situated on an isolated rock 900 feet above the plain, about four miles in circumference round the top, and ten or twelve at the base. The sides of the hill are covered with impenetrable bush and bamboo jungle. The town lay at the foot of the hill at the S.E. angle. The fort was loop-holed, as well as pierced for guns, and the only entrance to it was in the centre of the North wall, the sole approach to which, was a steep winding path up the face of the hill, the path being barred at intervals by seven gateways.

The besieging force assembled on the 19th January, under the command of Colonel Martindell. On the 21st a small hill about 800 yards to the N.E. of the fort was occupied. The 22nd and 23rd were employed in clearing the jungle and making a road for the guns, and on the following night, two 18-pounders were (after great labour) with the assistance of parties from the 8th Royal Irish Dragoons and the 53rd Foot, got up and placed in battery on the top. The next day, two mortars and two more guns followed, and two other batteries were erected at the foot of the hill facing the main gate.

Everything being ready, all the batteries opened fire at daybreak on the 28th. The enemy's guns were immediately dismounted the bastion opposite to the guns on the hill demolished and the town taken the same day after very slight resistance. The bombardment continued until the 2nd February when the breach being considered practicable, a storming party advanced to assault it. After proceeding a short distance, they were brought to a standstill by a perpendicular rock, 20 feet high; the enemy rolling showers of large stones down on them, crushed and broke their ladders, and compelled them to retire with heavy loss. The Killahdar was however glad to come to terms, and on the 8th our troops marched into Kalinjar. Major Fuller commanded the Artillery at this Siege and their exertions were acknowledged in G.O.'s in the following terms :—"The Governor-"General deems it his duty to express his concurrence in the honourable "testimony, borne to the distinguished service of the Artillery and "Engineer Departments, by Colonel Martindell."

1813. The neighbouring districts of Baghelkhand and Rewah, were during the following year, the scenes of more petty warfare, and though marked by no features of great importance, they involved much exertion on the part of the troops engaged, and more especially on the Artillery. There are few records extant of this campaign, it is impossible therefore to give full details of it.

Siege of Etar.

The raids of the Pindaris were becoming more and more frequent, even within the bounds of British territory, and Sarned Singh, the chief of a small but strong fort at Etar, had to be reduced to submission. Accordingly a mixed force, marched against him under the command of Lieut.-Colonel Adams. When the force arrived, it was found that Sarned Singh had burnt down the village and retired inside the fort. At noon on the 4th December, the guns (covered by previously erected screens) opened fire at a range of 350 yards. At 5 p.m. the breach having been reported practicable, a party was told off for the assault. For an hour and ten minutes the garrison defended themselves with desperate bravery, and only surrendered themselves when none but wounded men were left. Sarned Singh preferring death to surrender, blew himself up. The assailants' loss was six killed and sixty-four wounded.

Captain Stark (who was in command of the Artillery) and the officers under him, were thanked for their services by Colonel Adams in his despatch of the 5th, and in the detachment orders of the following day.

An important change in the locale of the regiment took place in 1813, when the head-quarters which had previously been at Fort William, were moved to Dum Dum. The move was a very popular one, and for many years the station was a great favourite, its mess, its excellent band, its amateur theatre, and at one time its pack of foxhounds, rendering it a place of resort to many from Calcutta and the neighbouring stations.

1814. Towards the end of the year the Nepaul war commenced.

1815. Operations in Kamaon.

In 1815, a detachment of Bengal Artillery was sent to join Colonel Nicholls's force in the province of Kamaon. On the 5th April the force entered the hills, and on the 25th the stockades on the Seetoli heights were successfully carried, the enemy being driven into Fort Almora and the post of Hari Dungri overlooking the fort occupied. After great difficulty two 4½ inch mortars were placed in battery and opened fire at 6 o'clock the same evening, an 8-inch mortar was also got into action about midnight.

The next morning, the advanced posts were pushed up to within seventy yards of the fort, and a few large shells thrown into it by Lieut. C. H. Bell drove a portion of the garrison out. At 9 p.m. a flag of truce arrived, and the next day a convention was signed, by which the whole province of Kamaon was ceded to the British.

In Colonel Nicolls's report he says:—"I feel much indebted to "Lieutenants Bell and Wilson for their activity in laying and bringing "these mortars into action so soon," and in G.O's the Governor-General states that these officers "are mentioned in terms of strong commendation".

1816. In April, 1816, the Commandant Sir John Horsford closed his long and honourable career with the regiment. His death was sudden and it is believed was due to heart disease. Major-General Hardwicke succeeded Major-General Horsford as commandant.

1817. A slight change was made in the uniform by a G.O. dated 16th January 1817, which introduced the shako, in place of the cap of black goat-skin which had hitherto been worn.

In the latter part of 1817, the Pindari—Mahratta War broke out, and the Reserve Division of the Grand Army, assembled near Rewari, under the command of Sir David Ochterlony. This force was intended to cover Delhi, to support our negotiations with the Rajput States and Ameer Khan. In December, Sir David with part of his force moved towards Jeypore, and Brigadier-General J. Arnold was left in command at Rewari.

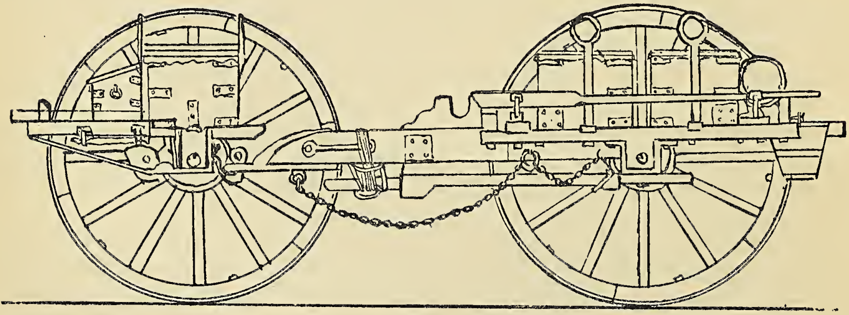
1818. Operations in the Hariana and Bhatiana districts.

In 1818, Arnold was sent to reduce certain forts in the Hariana and Bhatiana districts, picking up a small battering train at Delhi on the way. Tarajarh, the citadel of Ajmir, garrisoned by Scindiah's troops was compelled to surrender in July, after batteries had been erected. Other minor operations took place in the neighbourhood of Bikanir.

In 1818, the Regiment was reorganized, and its strength increased by 57 officers and 330 N.C.O's and men. The Foot Artillery was formed into three battalions of eight companies each, and a separate provision made as regards officers for the Horse Artillery, who had hitherto been taken from the Foot Artillery as occasion required. All the captain-lieutenants were promoted, and the rank abolished; fire-workers became 2nd lieutenants; gunners, bombardiers, and matrosses (our last naval term) were turned into gunners.

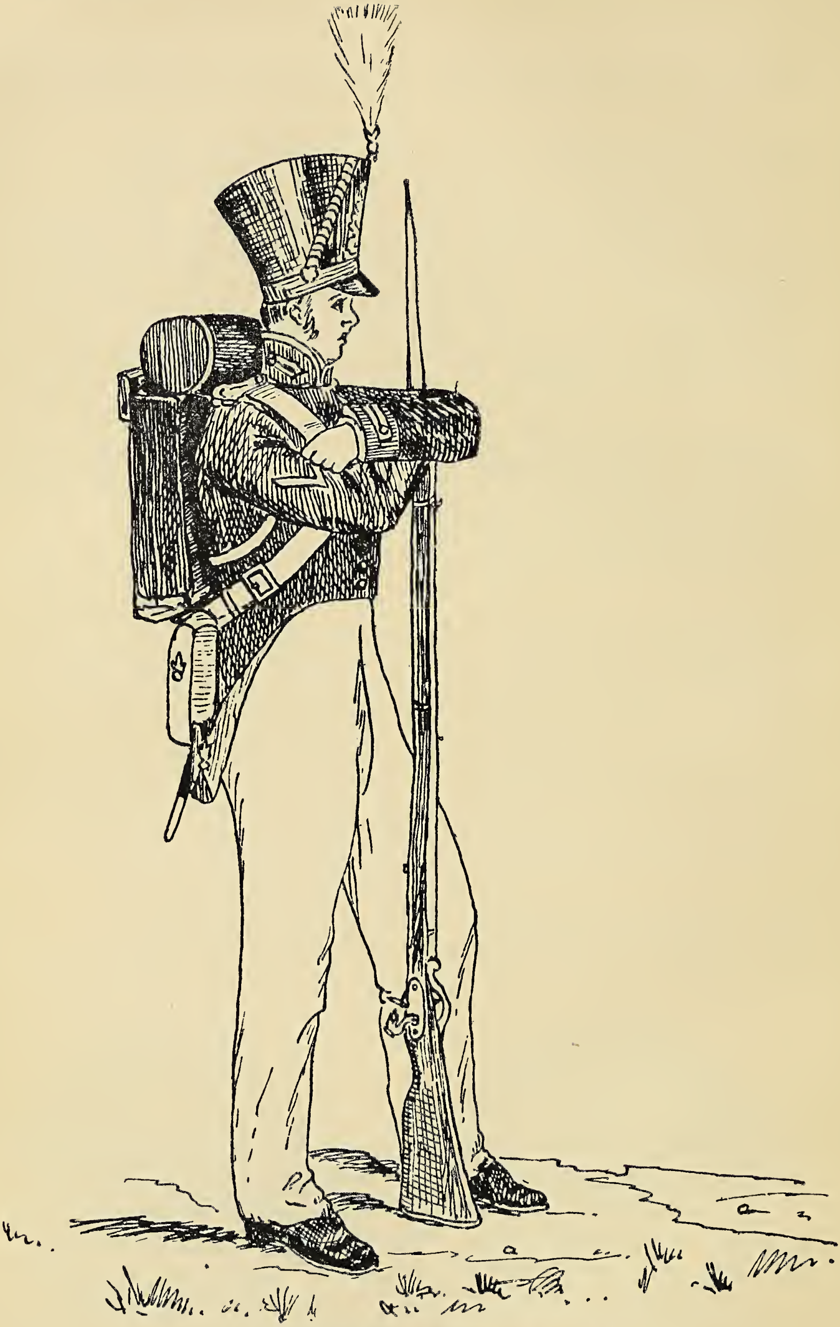
1820. In 1820, Military Savings Banks were started in India and proved a great boon to the men.

1823. In December, 1823, Brigadier Hardwicke vacated the command of the regiment and was succeeded by Colonel Alexander Macleod, C.B.



Ammunition Waggon, 1823.

1824. This year the Regiment was again reorganized, this time into five battalions, each of four companies, four companies



GUNNER, 1829.

being reduced altogether. The order of seniority of the companies of Foot Artillery was completely changed, though why, it is difficult to say. Owing however, to the scattered state of the regiment, and the war in Burmah, these changes although ordered by G.O. of May, 1824, did not come into force even nominally until the middle of the following year.

1825. Expedition to Arracan. In the cold season of 1825, reinforcements were sent to the Arracan Force in Burmah, (the 4th company, 4th Battalion Bengal Artillery, with Lieut. Rutherford and 2nd Lieut. Buckle being amongst them). This force, which was under the command of General Morrison, was intended to have crossed the mountains and joined Sir Archibald Campbell's force from Rangoon. Owing, however, to the miles of swamps and dense forests, no road passable for guns could be made, and the attempt was reluctantly abandoned. This disappointment was not the greatest misfortune which befell the Army of Arracan. The rainy season brought with it fever and dysentry, which carried off such vast numbers, that it was deemed advisable to evacuate Arracan altogether. The troops were located on the islands of Cheduba, Ramree and Akyab and on the opposite coast of Sandoway, where the climate appeared healthier.

1826. In 1826 the Artillery was finally withdrawn and returned to India.

1829. The year 1829 was one of reductions. At all stations within a certain distance of Fort William, the officer's pay was reduced by one-half the allowance termed "batta". Allahabad, Benares, Dinapore and Dum Dum came within these limits. It pressed sorely on Artillery Officers, the regimental head-quarters being included.

The uniform of the foot Artillery was laid down in a R.O. dated 5th February, 1829 as follows :—Dark blue coatee with swallow-tails and scarlet facings, blue trousers with a broad lace stripe, a broad white buff shoulder-belt worn over the right shoulder, with slings for field and frog for the lower ranks. Field officers to wear two, and the junior ranks one epaulette.

Several years now passed away, in which there were no features of interest worth recording. Such universal quiet reigned, that it appeared as if swords and lances might be most usefully turned into plough-shares and reaping-hooks, and the army looked round in vain for employment.

1831. Sir Alexander Macleod died at Dum Dum on the 20th August 1831, and was succeeded by Colonel Clement Brown, C.B., who retained the command of the regiment for five years.

1836. In 1836 Colonel H. Faithfull succeeded to the command of the Regiment. An incident which is interesting, as showing how the Gunners were treated in those days in the matter of appointment to the higher commands occurred to this officer. Colonel Faithfull, an admittedly smart and efficient officer in his own line, considering that his seniority gave him a claim to the command of a district, officially applied for one. His application was refused, and a junior officer of cavalry given the appointment instead. Colonel Faithfull openly expressed his dissatisfaction at his supersession, whereupon the Commander-in-Chief published a most extraordinary letter to the army. After explaining that in his opinion, a Brigadier should be able to personally instruct his command, he passed the following sweeping condemnation on the Artillery in general. "The Commander-in-Chief "has the highest respect for the officers of the Artillery. and he well "knows their many high qualities, but unfortunately he doubts their "general attainments in these points, and therefore he deems them unfitted in ordinary cases to receive such commands as Colonel Faithfull "covets." He then proceeded to issue a challenge to Colonel Faithfull.

"If Colonel Faithfull is an exception to this, and is master of the "military qualifications alluded to, then the Commander-in-Chief will "be sorry to have passed him over, and he offers to Colonel Faithfull "his permission to come to head-quarters forthwith, and he will place "a brigade at Barrackpore in his hands, and enable him to show his fitness for such a command under his own eye; or, he will do the same "thing, on the first favourable opportunity which presents itself, when "he goes to the Upper Provinces."

Colonel Faithfull at once wrote and accepted the offer, but when this came to be known a cry of dismay went up on all sides. It was said that this was the thin end of the wedge, and the first step towards introducing a regular system of examination for promotion and appointments, and half the newspapers in India wrote begging him to pause, before accepting the Commander-in-Chief's challenge, and thus creating a precedent which could end in nothing but the ruin of many old and deserving, but professionally ignorant officers. Whether these appeals influenced him or not, it is impossible to say, but certain it is, that Colonel Faithfull never submitted himself to the test, and so lost not only his brigade, but also the unique distinction, of being the first British officer to obtain promotion by passing an examination.

1838. In 1838, Colonel Faithfull was succeeded in the command by Colonel W. H. Whish, C.B., and he in turn by Colonel W. H. L. Frith.

About this time, Battalion Messes were first officially recognized by the Government, and a G.O. was published stating that a mess allowance of Rs. 100 a month might be drawn in all cases where it was certified that a mess had actually been maintained. Lieut.-Colonel J. F. Dundas, commanding the 2nd Battalion of the Bengal Artillery, determined that his battalion should have a mess, but he was equally determined that the expense of starting it, should fall on the Government, and not on his officers. He clearly saw that the only means of doing this, was to draw and save up the Government allowance, until he had collected the necessary capital. The only difficulty in the matter was to find a way of reconciling his conscience to signing the following certificate:—"I do certify, upon my honour, that a mess "has been maintained in the battalion under my command during the "month of . . . . 1835."

He however started a flock of sheep with two shepherds to look after them which he christened the "mess flock," and on the strength of this, certified that a mess had been maintained, and drew the allowance accordingly. All went well for six months, when he had a quarrel with one of his captains named Rawlins, who promptly submitted charges against him for signing false certificates. Colonel Dundas was tried by court-martial, but although the facts were not denied, the Court honourably acquitted him, on the ground that the establishment of the flock of sheep, so clearly showed that he intended to have a mess some day, that he was fully justified in certifying that one was actually maintained. The Commander-in-Chief in a long minute on the Proceedings, sarcastically commented as follows:—"It is not desirable in an address to the army to verge on the "ridiculous; yet it is impossible to avoid hinting, how far the latitude "of interpretation which the Court has given, might be carried, and "it may be quite reasonable to ask, whether, if the keeping of a flock "of sheep constitutes the 'maintaining of a mess' the keeping of "a flock of poultry—which flock might be composed of any plural "number—would not afford an equally sound basis for the argument "they have admitted? Can officers think that such perversion of "common terms, used in general orders, can be allowed through all "ranks of the army? or can they think that the service can be carried "on, if such latitude is sanctioned for everybody?"

These remarks do not appear to have been taken in good part by the army, who seized on the unfortunate statement, that any plural number constituted a flock, and for a long time afterwards wrote in the newspapers of a brace of partridges as "a flock of partridges," and even of a double sentry, as a "flock of sentries".

1842. The next change in the Regiment was the addition in March, 1842, of one company to each battalion of the European Artillery, by reducing the strength of the other four by one-fifth, thus causing no difference in the numerical strength of the whole. Under the new organization the establishment of a company was:— one staff-sergeant, four sergeants, four corporals, eight bombardiers, two buglers and sixty-four gunners, with officers as before.

1843. In 1843, the attention of the supreme Government was directed to a new quarter, and the progress of events in Gwalior was watched with considerable interest. Since the death of the Maharajah Junkoyah Rao Scindia, anarchy and confusion had reigned supreme in the Maharatta capital, and its hostility to the British was becoming more and more pronounced. A diplomatic settlement of affairs appeared difficult, if not impossible; so in November, Lord Ellenborough determined to assemble a force on the banks of the Jumna. This force (which was about 14,000 strong), was called the "Army of Exercise," and was under the personal command of the Commander-in-Chief, Sir Hugh Gough, Colonel J. Tennant being appointed to command the Artillery with the rank of Brigadier-General.

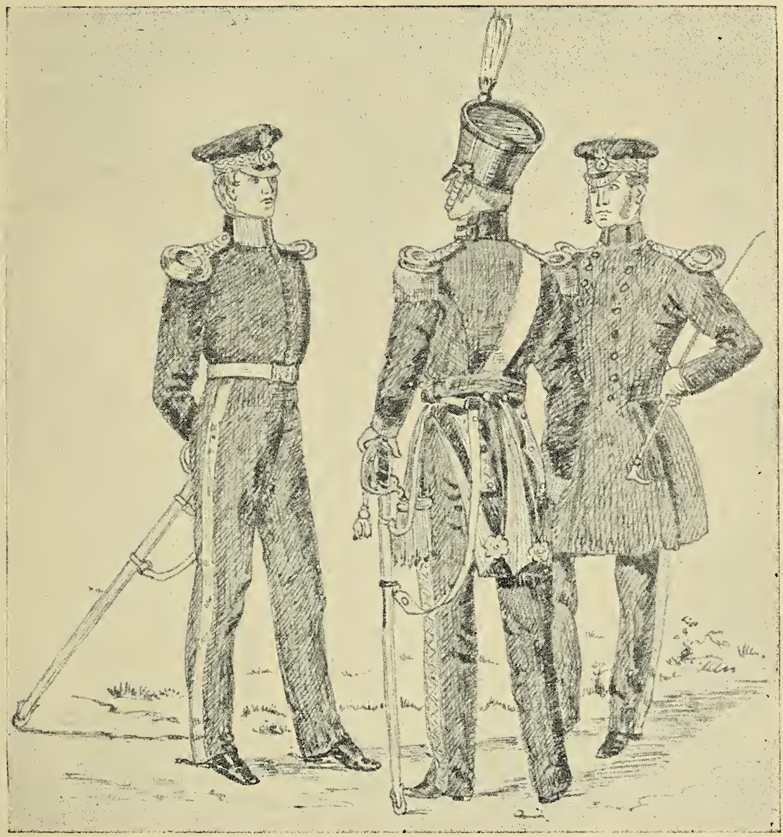
Hostilities broke out on the 29th December and from then until the beginning of 1850, the Bengal Artillery were almost continuously on active service and saw a great deal of hard fighting at Maharajpur, Ferozeshah, Sobraon, Chillianwallah, Gujerat &c., the magnificent services they rendered are duly recorded in the history of those battles.

1846. In 1846, the bell shaped shako was replaced by one of modern shape, without the gold lace edging at the top and bottom.

1850. From 1850 to 1863 detachments of the Bengal Artillery were engaged in various expeditions against the tribes on the North West Frontier under Sir Charles Napier, K.C.B., Colonel (afterwards Sir Colin) Campbell and others.

I am afraid I must not dwell on the terrible scenes which were enacted in India in 1857–58, for to deal adequately with the hardships of the Siege of Lucknow, or the horrors of the massacre of Cawnpore, to say nothing of the many minor actions which occurred later on would be far beyond the scope of the present article. I will only say that the Bengal gunners were in the thick of it all, and staunchly upheld the brilliant traditions of their Corps.

1861. In 1861 steps were taken to amalgamate the Indian with the Royal Artillery and in that year the Bengal Artillery ceased to exist as a separate corps and became part and parcel of the Royal Regiment of Artillery.



OFFICERS BENGAL FOOT AND FIELD ARTILLERY, 1848.

COAST DEFENCE AGAINST TORPEDO-BOAT ATTACK.

— BY —

MAJOR-GENERAL J. B. RICHARDSON.

Manœuvres at Gibraltar.

DURING the last few years, thanks to the cordial co-operation of the Naval Authorities, considerable experience has been gained at Gibraltar in the matter of attacking shipping by Torpedo-Boats and in repelling these attacks by Q.F. guns, both in moonlight and with electric lights. In the belief that this experience, and deductions made by its aid, may prove interesting and instructive to the Artillery generally, this paper is put forward.

Naval Defence against Torpedo-Boat attack.

To the Naval man, defence against Torpedo-Boat attack is a vital matter, and receives earnest attention. His existence may depend on his ability to keep exceedingly fast but small boats at a distance of say 1,000 yards from his ship. He naturally maintains all means of doing so of which he knows in a very high state of efficiency by constant trial and practice. A free hand is given him and he has everything under his undivided control. Scouts may be out in the shape of destroyers, torpedo-boats, guard-boats, etc., but he does not trust only to these; attacking boats may slip through such outposts and he then relies on a great mass of what is practically, except as regards direction, unaimed fire, from light Q.F. and machine guns, aided by electric lights, nets, etc., all under his own hand. Looking to the value of his charge, he is granted a considerable amount of ammunition for the practice which can alone make his defence perfect; and he is little hampered by the need of reference, that curse of the Army. He has a serious business to perform and he does not mince matters. In his own element, the open sea, his precautions probably enable him to beat off torpedo-boat attacks with ease, the balance of probability being decidedly in his favour. As he approaches narrow waters his chances of successful defence diminish; and his individual powers are at a minimum when his ship is at rest in a crowded harbour, though he can surround himself with obstructions and can then, in many places, be very excellently defended from the shore.

Trained to rely on himself, for the most part the naval officer knows very little and believes less in the powerful aid shore batteries can render him, yet on the very few occasions in which the Navy and Coast Artillery have been enabled to work together, though he exhibits contempt for the system which cripples the shore artillery, by making them entirely dependent for their efficiency on a variety of departments working independently of them, and also in the numerical weakness of their armament, his views as to the part they could undertake in keeping him free from attack, if they were properly practiced and given the free hand he himself gets, undergo a considerable modification. Accustomed to fire from guns on a low level the naval officer credits the striking power of all guns high or low as about equal, but he now sees the very much greater certainty with which shells can be made to strike small moving objects when fired from guns on a high site; the advantages they would possess if auto-sighted over his own low sited guns, and the enormously better field of view which they obtain at night over the sea. The gain in having the electric light on a steady platform and the possibility of placing it at the best height for the guns to act commends itself to him. The height of his own lights, like that of his guns, being limited.

Garrison Artillery defence.

Torpedo-boats can, in themselves, do no harm to shore defences. Perhaps, as a consequence, Garrison Artillery are apt to treat that part of their work which deals with resistance to their raids as a matter of comparatively light importance. In reality it is a difficult and by no means light duty; one which, at a great number of stations, would be the first called into play in the event of war and a task which requires the very greatest efficiency, both of *personnel* and *matériel,* to be of any use whatever on most nights in the year. Yet, given reasonably placed Q.F.'s and facilities for using them such as modern artillery science can readily provide, it should be a disgrace to them if they allow a boat to slip in and do damage on any fairly clear night. A heavy armament appeals much more strongly to the imagination both of gunners and the public, but, as far as regards attack by ships, if heavy guns are at all well sited and mounted, they can only be effectively engaged by day, when they have a large easily seen target, much more vulnerable than themselves and one which they can batter with every advantage on their side except choice of time. The enormous amount of ammunition expended by the American fleet in Cuba against a feeble armament, chiefly mounted on heights in improvised defences, without any corresponding result is sufficient to show the advantages shore defences possess.

Siting of guns and lights.

The siting of light Q.F. guns and that of electric lights in any given fortress so as to oppose the greatest possible difficulties to the safe approach of torpedo-boats is, owing to the many unexpected complications which crop up, a very difficult problem when attempted from an office desk. General rules have been sought from trials here and there but, generally from too limited an experience, these frequently break down when applied to a fresh situation and there appears but one satisfactory method of arriving at a solution of the problem for any particular locality, that of practical trial on the spot, a method which so often upsets plausible theories. The two things, guns and lights, hang so much on one another that it appears fatal to separate them as is done in our service. The lights (except on a mine field) are absolutely no use without the guns, and the guns on many nights in the year are useless without the closest co-operation of the lights. Without such intimate co-operation the lights may, and at present frequently do prevent the guns acting at all, though the guns could sometimes be effective if the lights were not there.

Disunited defence.

There seems to be a prevalent notion that torpedo boat attack can be met with a sort of "go as you please" system of guns and lights, that in fact each Q.F. battery and electric light installation will be most effective if left entirely to itself, uncontrolled and unaided. Manœuvres of any reasonable numbers of guns, lights and torpedo-boats working at one time show its fallacy. This unfortunate idea has crept in from the use of Q.F. batteries close to the water's edge, whence they can see little or nothing at night, while their fire is almost unaimed. It is then possible for control to be useless. A very little practical work at manœuvres with reasonably sited guns suffices to prove that the old maxim 'unity is strength' is as true in counteracting torpedo boat attacks as it is in all other military operations. Torpedo-boats will slip in with ease through a disjointed defence when the attack is made by a combination of these vessels. Light Q.F. batteries sufficiently close to each other to fire into the same water areas will be comparatively ineffective, unless they are under very instantaneous and strict control. This is best effected, in most cases, by placing a superior artillery officer at some central station as a superintendent of gun fire. He should be able to see most, if not all, the water covered by his guns, and it is a distinct advantage if he can also see the positions of the Q.F. batteries themselves; it aids his decision when he knows what battery is firing. The central station must act as a sort of intelligence department to all its branches. It should receive reports, sift true from false, have the power of instantaneously checking or releasing fire, and of, somewhat less rapidly perhaps, warning batteries when it is discovered that boats are about, telling them the direction in which they were last seen. The central station should be on the highest available ground; it should be fitted with a C.O.'s P.F. instrument, (or if on a very high site even a simpler means of giving bearing and range) and a large chart furnished with small leaden blocks representing torpedo-boats; by means of which the number of torpedo boats about will soon be conjectured as reports come in; even the plan of attack of the boats may gradually be worked out. The look out of the station must have the bell pushes of each battery of guns and of the electric lights close to his hand and distinguishable by the feel, for the lookout station itself must be in absolute darkness.

Difficulty in ranging uncontrolled batteries.

To convince anyone of the necessity for control it is usually sufficient to open fire from a number of absolutely independent batteries of Q.F. guns, at a fairly fast target in broad daylight. No battery, except such as are very high sited, say 600 ft., can distinguish its own shots and the means of ranging and hitting is removed. Very low sited Q.F.'s often never get on the target at all. If there is this confusion when working with the easiest possible of lights, what reasonable certainty of striking torpedo-boats can be looked for when the difficulties of seeing are enormously increased? There can at best, under such circumstances, be a mere dependance on a mass of what is practically unaimed fire for which the number of guns usually supplied to fortresses is inadequate, and an abandonment of the advantages coast batteries possess over shipping; a waste in fact of artillery science. It is more probable that a torpedo-boat would be sunk or put out of action at night, by one battery of two well-placed and well-handled Q.F. guns, having the water area to itself, than by four or more Q.F. batteries firing on the "go as you please" system laid down for us.

Over control.

Undoubtedly any attempt to control light Q.F. batteries in little details is wrong, as it also is with heavier armaments if the *personnel* is well trained. Over control leads to dreadful slowness, and has been brought about by the natural nervousness of artillery officers when firing from guns manned by but partially trained gunners. But Q.F. batteries for night work must have well trained men to do any good at all, and it does not take long to train them with a little firing. Their opportunity for real work will perhaps not exceed three or four minutes at a time, for a boat will either run in or sheer off beaten back in that time, and to attempt to regulate fire in detail by a central authority, however clever and practised, would be to render the guns inopperative. Guns, even if supplied with auto-sights, must be ranged and those in charge of them must be given the opportunity of picking up accurate shooting.

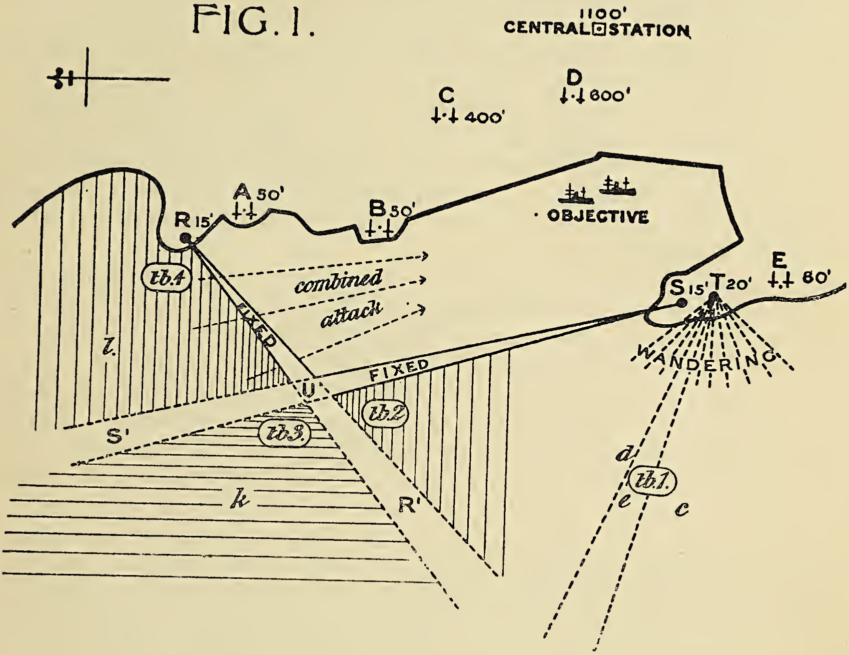
Suggested system of control.

The following method of working several Q.F. batteries is suggested as affording a very effective control. A central station for each distinct area under an experienced senior artillery officer, supplied with a reasonable staff of an officer, lookout and telephone men, glasses, instruments, charts, etc. This station must be in communication with each battery of Q.F. guns, and with each of the available electric beams, by means of an electric bell and a telephone. Guns and lights to have any chance of beating off an enterprising attack *must* be worked together for that common purpose.

Description of the working of a central station.

Perhaps a descriptive suggestion of the working of such a station, founded on actual occurrences during a week of manœuvres, may assist in understanding the system recommended. At these manœuvres, however, though there were many more lights than those shown, only one moving beam was actually under the control of the central station; the others, and some of the batteries, worked independently and the lights in consequence often prevented the low sited guns seeing to fire. I take for simplicity's sake only three lights, all low sited and five 2-gun Q.F. batteries at various heights.

FIG. 1.



Thus *R* and *S* are, in accordance with existing engineer methods, fixed lights. *T* was a wandering beam rigged up ashore by the Navy, beautifully worked by their men, and under the complete control of the central station by means of an electric bell. It, too, was low sited, but slightly higher than the two fixed lights. With the selection of position of electric lights the artillery have unfortunately nothing to say. The example given is perhaps an instance of the worst possible arrangement, but is all the more instructive. The attack was made by four boats.

The night—pitch dark. The two batteries, *A* and *B*, can see nothing outside the fixed rays *R U*, *S U*, being blinded by these fixed lights, and they are useless until the boats run through the fixed beams. *E* is also blinded when the wandering ray moves to the southward. Suppose a boat *t.b. 1* is picked up in the wandering ray *T*. *C* and *D*, seeing over the fixed rays *R U*, *S U*, and *E* at once open fire. The three batteries see many splashes (say *c*, *d*, *e*,) but none of them can tell which are its own splashes, and each is apt to alter wrongly. Seeing an absence of splashes in the exact neighbourhood of the boat, the central authority touches *D's* and *E's* bell, and they cease fire. *C* at once ranges; *D's* bell is touched half-a-minute after and recommences fire; having been short before, *D* can probably now range as *C's* splashes should be close to the boat, but if not *C* is stopped for a very short time, and so on, the fire of the batteries which have had the chance of ranging being effective out of all comparison with the unranged batteries. With auto-sights the system should be doubly valuable, as then once "on" will mean always "on," and a boat appreciating the increased accuracy will turn and go to sea, or rush for dark water as at *K* if it knows of it. Good practice from high sited 12-pr. Q.F. guns up to 5,000 yards may in this way be calculated on; at ranges of 4,000 and upwards however, rather more than half a minute must be allowed for ranging owing to increased time of flight. At long ranges there is not so much occasion for hurry, you may not so certainly sink the boat, but she can do no harm.

Suppose the boat *t.b.* had not been picked up by the wandering ray and, working in concert with others, she had been specially detailed to get as close as possible to the light *R* with a view to a combined attack from the north, through the ray *R U,* on the objective ships. She runs to *t.b. 2,* waits till the carbon of *R* needs adjustment and passes through to the dark water at *K,* say to *t.b. 3,* where she waits in perfect security, *R* and *S* being fixed lights, until the carbon of *S* also needed a change. Then she passes to the dark water *l* to rest until one or more of her consorts join her when, the rush being decided on, she moves to *t.b. 4* and fires shadow-laying at the light, attracting much attention on herself. Whether successful or not in destroying the light with her small Q.F.'s and rifles in a minute or so, she and her consorts, each a few hundred yards apart, must make their rush and, if batteries are working independently, with a good chance of success. *A, B, C, D* and one gun of *E,* all see them, but there is a strong tendency always exhibited to fire at the most easily seen boat, and one of the three boats at anyrate should get home. One boat is left out with instructions to show showers of sparks from her funnel and attract the attention of the wandering beam as soon as she hears *t.b. 4* commence firing at the light. The central station, however, knowing her range and that she cannot get home for several minutes, neglects her and turns the wandering ray on the real attack preventing the rushing boats seeing their objective. The central observer would moreover see which boats were not receiving proper attention and turn at least one battery on any boat near which he saw no shell falling. Attacks differ greatly, the above is founded on an actual attack made.

Fewer guns needed if guns and electric lights are high sited.

In this case there are perhaps plenty of guns but not sufficient electric lights available to beat off a well planned combined attack of four or five boats with any certainty, yet with a different siting of fewer guns and the same lights such an attack would have little chance of success. Thus as in Fig. II, *A* and *E* batteries might be thrown back on to heights to see over the rays. *B* could even be dispensed with. The lights all thrown back a little and raised while, though their general function may be to act as fixed lights, the central station must have the power of traversing them and changing the position of *U*. It is evident that the director of fire has now eight guns,

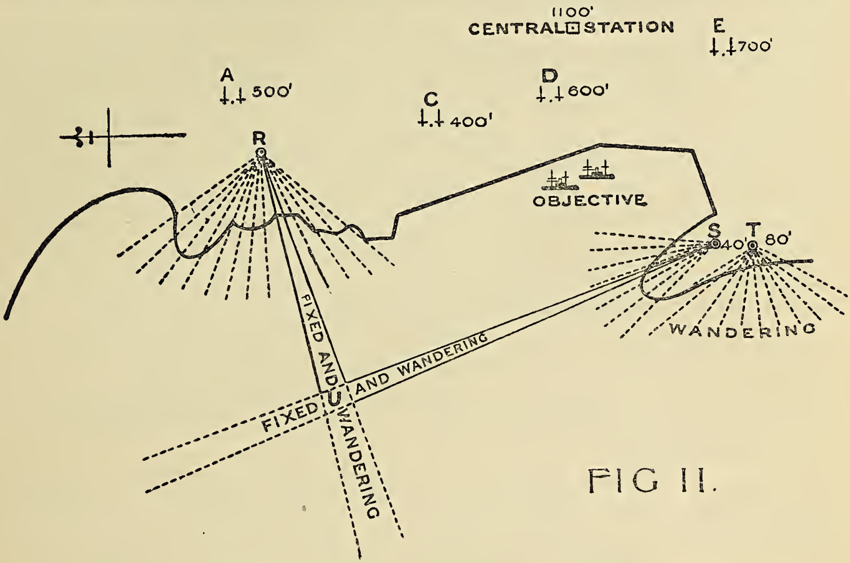


FIG 11.

instead of four, to act with from the very first, and the light *R* can, as it were, now defend itself. If the reader will take the trouble to repeat the incidents of the attack he will see that the central station has the advantage of the boats, for the moves of the latter are met; they can no longer lurk in security close to a beam.

High ground a great advantage.

Where no high ground is available the beating off of attacks becomes much more difficult. The garrison approaches the conditions of a ship; and more guns are needed to make chance fire effective. There are, however, few harbours where, in one position or another, something could not be done after practical trial to improve the means of seeing and shooting at boats.

Garrison Artillery doubtful of their role.

One great difficulty Garrison gunners labour under is a want of knowledge of what they are exactly expected to do with regard to repelling torpedo-boat attacks in each individual fortress, and a want of authority, where they do know, for arranging their plans. The Navy make their own schemes and often change them in accordance with their latest experience; defining areas into which they do not desire shore guns to shoot, arranging fresh boom defences, detailing guard-boats, etc., while the artillery, perhaps quite unaware of this, continue their training and arrangements with a view to defending the whole water area. Naval plans when examined are generally found to be based on the conjectured presence of a considerable naval force. If it could really be determined that there will always be a sufficient naval force at any given place the matter is extremely simple. Very few shore guns are then needed, and these being only to assist the Navy, the latter should be made to define exactly the water areas which they require shore guns to defend. The Navy, when in sufficient force, can best protect itself from torpedo-boat attack by keeping torpedo-destroyers, etc., at sea, booms, nets, etc. In this case it should only remain for Garrison Artillery to see that they have a reasonable quantity of suitable guns, mountings, and electric lights, all rightly placed to carry out the task assigned to them. Even so they have trouble for, unfortunately for them, this is a business entirely removed from their control. Others place their guns and electric lights, frequently mounting both of them unsuitably for artillery purposes. It is a consequence of this nursing of Garrison Artillery that the chances of successful co-operation with the Navy, in proportion to the money granted and expended, are often feeble. The nursing departments work, necessarily, on hard and fast rules, and have no elasticity for meeting unexpected local conditions or the wishes and needs of gunners. Unnecessarily elaborate magazines and emplacements are constructed which, once a gun is badly sited, fix it there permanently.

Naval assistance sometimes doubtful.

There are sea fortresses and coaling stations both at home and abroad as to which it would probably be very unsafe to count on the continued presence of a sufficient naval force locked up for local defence, whatever may be the scheme devised for that purpose by the Navy in time of peace. Our Navy is essentially an active, mobile power, capable of being applied anywhere, and it is incredible that circumstances may not arise to induce an admiral to take with him what he can lay his hands on for the purpose of striking a blow. It is frequently argued that if the admiral is out in front, as it were, of the base, the coast fortress is safe from serious attack. This, though perfect in theory and true generally in fact, has exceptions, and does not apply to light swift raids if the fortress is within striking distance of undestroyed hostile torpedo-boat stations. It is not only ships of war but all shipping which should be safe under British guns. Garrison Artillery must often therefore not rely too confidently on any naval scheme, or rather must be prepared for its being thrown over, and must be ready to defend naval areas as well as those that are peculiarly their own. This raises a certain amount of difficulty. If there is a permanent fixed and defined area into which shore guns are never to fire, it is very easy to put up the danger guard I have devised for gun emplacements, so that neither light Q.F. nor heavy armament can, even by accident, shoot into it. This is necessary because one piece of water is exactly like another, and the ‘naval area’ boundaries are entirely imaginary. But if there is the slightest probability of the guns having to defend a larger area, two or more danger guards must be placed one behind the other and must be made removable to permit any one of them to be used at will. None must be permanently fixed.

Danger guards.

Distinguishing friendly from adverse boats. Manœuvres seem to have clearly demonstrated one fact, viz.: that until ingenuity is encouraged to devise a workable method of enabling shore gunners to distinguish friendly boats and launches moving about at night, from attacking boats, either the fortress guns are terribly crippled, or at the very least, made very uncertain in their action, or the friendly boats are sure to be hit. It is frequently stated that the Navy have been so far unable to devise a plan whereby their ships can instantly and certainly recognize their own boats at night. Whether this is so or not the Gibraltar manœuvres have shewn that, while the difficulty of distinguishing friend from foe, from a height not greater than a ship's tops may be insuperable, yet, where considerable heights are available, the case is not only far from hopeless, but promises to be fairly easy of solution, provided the shore guns are on a height and under the instantaneous control of a high station. This control can be readily obtained by the use of common electric bells at the guns, supplemented by the slower telephone. The signals from the boats must be continuous. Fairly frequent combined practice between boats and guns is, however, needed to make it at all safe for the former to be cruising about at night within range, and even then the anxieties of those in charge of the shore batteries, and of the lookouts, is vastly increased. When a considerable naval force is available, it may at times be advisable to limit the action of the shore guns to clear weather, when it is quite certain; making the defence in thick weather an active naval defence. The beautiful shooting of high, well mounted and well found, light Q.F. guns is, however, a means of defence which should never be lightly put on one side; the time may come when an overworked or temporarily crippled navy will be only too thankful for the rest which Garrison Artillery can assure them if permitted and encouraged to give it.

Want of practice. The average Garrison Artilleryman who has not had practice in resisting torpedo-boat attacks by night has generally a very wild notion of what these craft are likely to attempt, what they look like, and what devices they may use to elude his vigilance. It is of the first importance that he should, if possible, be sent out in a torpedo-boat during night manœuvres to watch what is done. One night spent in endeavouring to creep up unseen to within striking distance of their objective will go far to put him on his guard. It is exciting work at times and once bitten with it he will always try to get out again. Until he has this experience, his belief is frequently found to be that torpedo-boats rush about at a twenty knot speed, broadside on in the same way as he sees them dashing about when manœuvring in the day time. If an enemy will only act thus, and our lookouts are high enough, the discovery of his torpedo-boats on many nights even without the aid of search lights, and always with them, is a simple matter. The wake of a rapidly moving torpedo-boat gives her away directly, it is often seen hundreds of yards behind her and the eye running forward along the track comes on the boat itself. But, except for a final rush, if she finds herself discovered, this is not the way a cleverly handled boat conducts its business. Handled, as our navy do handle them, with infinite nerve and patience, moving dead slow, stoked with such ability that not a spark leaves the funnel, a torpedo-boat is most difficult to detect and at any considerable range is often passed over unobserved by wandering rays. As the ray approaches, she perhaps, turns end on to it and stops; when, even if seen, she is often mistaken for a small fishing boat or something drifting, an error which even good lookouts are apt to fall into if a boat patiently waits without attempting to move, even though a round or two is fired at her. The best method of testing what a doubtful object may be is to take her range, bearing and speed (if it is thought unadvisable to waste much ammunition at extreme ranges), as quickly as possible and pass on with the light, to try and convey to the boat the impression that she has not been observed. Allow a few minutes to elapse and come back on her. If she has moved a considerable distance at a different rate in the interval, it is a torpedo-boat and it is as well to sink her; if she has not moved she is doing no harm, and the process can be repeated at intervals. Subsequent observation may show that she is creeping slowly up and it then becomes time to expend ammunition on her and make her either rush in or go out to sea again.

It undetected by a wandering beam and a torpedo-boat desires to cross a fixed ray which she cannot get round by going far enough out, she either lies quietly just outside the fixed ray, in what has been termed by the lookouts the "dark ray," where she is quite invisible, and waits until a carbon needs changing to slip easily through, or else steams slowly up along the 'dark ray' until she gets as close as the land will allow her to the light, and seeks to destroy it with her fire so as to enable other boats to get to the ship which forms the objective of the attack. Various attempts are made to deceive. A torpedo-boat may come up boldly with navigation lights boomed out to represent the lights of a friendly merchant vessel, for her own navigation lights are too close together to be mistaken. Such lights, however, are necessarily rather close to the surface of the water and the interval between them and their reflection is too small to deceive an expert for long, or prevent him examining her with the beam. If guns are low sited, boats may float smoke barrels with the tide across the electric rays with a view to making them dim, but this has generally proved a failure from one cause or another. The presence of smoke in an unaccountable place only serves as a warning to guns to keep a brighter lookout. Smoke barrels do not seem to affect high sited lookouts and guns at all. Every vessel approaching, no matter what may be known of her, must be carefully examined. No trick is more common than for a flotilla of torpedo-boats to come up on the off side of a merchant vessel approaching a harbour with a view to a sudden rush if they can get close enough unobserved; in such a case a careful examination under the light will generally exhibit an abnormal lengthening of the vessel from time to time as one torpedo-boat or

Deceptions practiced by torpedo-boats.

another drops by chance a little behind. The vessel should be at once fired in front of and stopped.

Wake of torpedo-boats.

Torpedo-boats leave a remarkable and characteristic wake in anything like smooth water, said to be due to the waste lubricating oil pumped from their bilges. If in the early morning such streaks are seen it may be conjectured that boats have been in the neighbourhood during the night.

Disguises.

Training of lookout-men.

Knowledge of "Rules of the road at sea" necessary.

Torpedo-boats may disguise themselves in ways which it is perhaps best not to suggest. A Garrison Artillery lookout-man must be astonished at nothing. Anything unusual or unaccountable must arouse his suspicion and be carefully watched for fresh developments; indeed success in repelling the stealthy approach of torpedo-boats is very largely dependent on a trustworthy watch being kept. Experience, during long manœuvres, has shown that training is as necessary in this as in all other branches of Coast Defence, but the fact is but little recognized by Garrison Artillery, while the opportunities given them for practice are rare. At Gibraltar, where the peace lookout is in the hands of the Royal Engineers, on each occasion of manœuvres, the lookout-men had had, for the most part, no training; men who had been present at former manœuvres and who had acquired some idea of what to look for, and what to report, were scarce, and for the most part lookouts were raw and often alarmed the detachments unnecessarily. Thus, for instance, a light house on the opposite coast, showing a green light, was over and over again reported as a suspicious craft part, at anyrate, of the detachments being unnecessarily roused; while passing steamers, a long way out, and with manifestly no intention of coming within range, were continually being reported. It was seen that a considerable general knowledge of navigation lights and the "Rules of the road at sea" is indispensable for officers, N.C.O's, and lookout-men. It is a direct proof of good training where it is seen that detachments not only turn out and do good work within a minute of being called up, but it is perhaps a stronger proof where the men are very seldom turned out at all. Such troops will never be worn out by a blockading fleet and will assuredly be smart when the opportunity really comes and the best of work is needed.

Detachments must be sheltered close to the guns.

Orders for posting lookout-men.

For guns intended for repelling torpedo-boat raids, it is found essential that the detachments should live in shelters quite close to the guns, while, considering the somewhat dreary, prolonged, and generally fruitless watch that would have to be kept night after night, perhaps for months together in time of war, it is advisable that the men should be disturbed by false alarms as little as possible, being permitted to sleep or amuse themselves during the night as best they can, provided they turn out and are in action with extreme smartness on the whistle sounding. At the Gibraltar manœuvres the orders given for the lookout men were to the following effect:—

BY DAY.

On the best position for seeing the water area one lookout-man per battery is to be posted. He will keep a look out all round and report at once anything he observes, as directed by the Battery Commander. Before quitting his post on relief he will point out anything under observation to his successor. (This day lookout was, of course, much of the nature of an ordinary sentry except that his arms and ammunition were near him only and his hands were free to use glasses.)

BY NIGHT.

Six men will be detailed for each battery, say *A, B, C, D, E* and *F*. Each man will be on watch for two hours.

A will relieve the day lookout half an hour before sunset.
B will be posted one hour after *A*.
C „ „ „ „ „ „ *B* in relief of *A*.
D „ „ „ „ „ „ *C* „ „ „ *B*.

and so on

There was thus always one lookout who had been sometime at work and whose eyes were accustomed to the light, aspect of water area, etc.

Each of these men require binoculars. Those supplied during the Gibraltar manœuvres were excellent. They were of naval pattern, but were perhaps unnecessarily heavy.

Lookouts for low batteries.

Lookout-men at low sited batteries can see comparatively little, and in this case it may often be found better to keep one of the night lookout-men either in communication with the lookouts of the nearest high sited battery or send him to any higher place in the neighbourhood that may be available, from whence he can shout warning to the battery lookout-man. A portable, or permanent, telephone would, of course be much better, as the man could be sent to a more distant position. His shouts are apt to disturb the detachments unnecessarily.

Attention must not be concentrated on single boats.

Lookout-men must have it continually impressed on them not to allow their attention to become absorbed on a single boat. False attacks are purposely made to divert attention from the real and several real attacks may take place simultaneously. The system adopted at Gibraltar for lookout-men answered very satisfactorily when the lookout-men were reasonably clever. It prevented the men at the guns being worn out by long vigils; but many men displayed a lack of intelligence, or gave way to fancy, and in this event the N.C.O. or B.C. got too little rest. Probably sufficient reliable men could be found in each battery for lookout men, who in case of war should receive a small premium on truly reporting a hostile boat, with a deduction for false alarms. The untrustworthy men must be put to do the drudgery of the detachments, day lookout duty, etc. The efficiency of the defence so largely

Reliable lookout-men needed.

depends on good lookouts that every encouragement should be given to capable men. An ordinary sentry does not meet the case.

Eyesight.

The vision of some of the men was found to be extraordinarily good at night and very correct. Such men should be noted, but it is impossible to pick them out without practice. Their ability in this respect seemed to have no connection with their ordinary avocation. Clerks from offices were sometimes as good as any. At the commencement of manœuvres the great majority do not know the appearance by night of what they are looking for; a torpedo-boat in the moonlight, electric beam, or in comparative darkness, seen from a high site is a very different object to what they know of it rushing about by day. It is difficult to impress on lookouts that a torpedo-boat is most deadly and difficult for them to deal with when she is stealing about dead slow leaving no wake. In almost every case in which torpedo-boats are made out without the aid of lights they are going at speed. Then their wake hundreds of yards behind them is first seen from a height and, followed by the eye, leads to the boat itself. Sometimes a spark flies from the funnel and catches a lookout's eye, almost unconsciously, directing his attention particularly to that part of the sea area where he eventually detects the boat, but even then it is generally the wash of the sea against the boat, or her wake, that he sees before he can satisfy himself as to the form of the boat itself.

Men do not know what they are expected to see.

Wake often seen first.

Wandering versus fixed beams.

On exactly the same principle that an offensive defence is very much more effective than a passive defence, a wandering electric beam is much more dreaded by attacking boats than a fixed beam, though the latter are what are mostly placed by the Engineers for Artillery use. When operations are really prolonged sufficiently to closely resemble actual war conditions, many points are brought to notice that escape the more limited experience of experimental committees. No doubt in one or two localities fixed beams have answered admirably, under specially skilled management, for an hour or two of experimental trial, with the result that they have been recommended for universal adoption; but in wearying prolonged trials, boats are found to easily slip through such fixed beams unobserved. It is a mere question of time. They lie patiently, even for half the night, until the light requires adjustment (it is a very cleverly managed light that does not require it frequently), and they are through in a few seconds—or, if the light is low sited they go out to sea a mile or two and pass through the blind angle caused by the curvature of the earth. In nine cases out of ten the belief inculcated in a fixed ray has greatly aided the boats; for if there is a wandering ray on the side of the fixed beam away from the boat, the light of the latter interferes with the wandering beam, while if boat and wandering beam are on the same side of the fixed ray, the wandering beam has displayed a tendency in most hands, to leave the neighbourhood of the fixed beam severely alone. Nothing would be so disconcerting to a boat commander as to find the fixed beam, under whose shelter he is comfortably waiting his chance, suddenly move on to him. He would have to go.

Narrow channels.

There may be, and probably are, localities, such as comparatively narrow channels across which an electric beam has complete power, where it may be thought distinctly advisable to keep a beam, capable of wandering, as a general rule steady on one bearing; but the power of motion and its judicious use is most valuable for gun defence. Boats will never effect much singly; moving beams are scarce, and there are no fighting lights, and thus the wandering beam is often occupied with a boat sent in purposely to show itself while the true attackers are dodging the rigidly fixed beam.

Uncertainty caused by fixed beam a possible advantage.

The one good thing with which a fixed beam may be credited, when conditions are favorable to its use, is the uncertainty it imposes on the attack. The carefully laid schemes of attacking boats are a good deal upset if they depend on a time basis. It is impossible to say when the light will break down, and if ordered to rendezvous at a certain hour inside the fixed beam for the purpose of a combined rush at a given hour it is probable that only one or two boats will have succeeded in reaching the rendezvous and some confusion may result. It is impossible to foresee everything and in such a case there is likely to be either hesitation or premature action, either of which may lead to failure.

Fixed beams useful where there are no trained look-out-men.

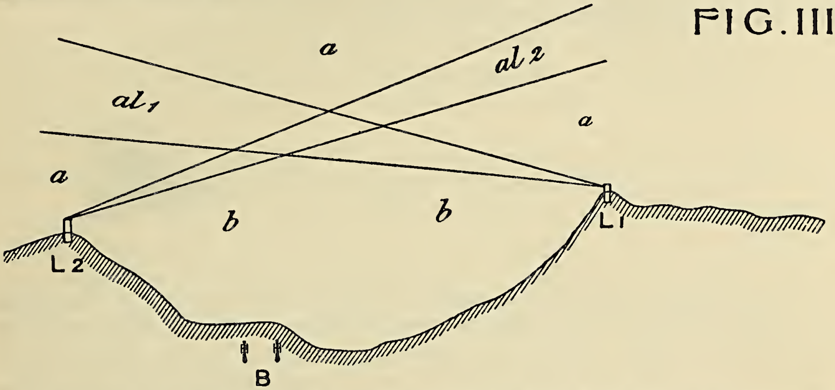
If there are no good lookout-men the use of a fixed beam in a narrow channel may be an advantage. A lookout man must be bad indeed if he does not detect a torpedo-boat crossing a light at close range; but a torpedo-boat is very poorly handled if she runs into a fixed beam, except to draw attention off her consorts. She can always get through if she waits long enough.

Concentrated and dispersed beams.

A concentrated beam penetrates a much greater distance in nearly all states of the atmosphere than a dispersed beam, but it covers a comparatively small area of water. The dispersed beam gives a dim diffused light that often does not show up torpedo-boats as a good target for guns unless the boats are fairly close in, while it is noticeable that guns rarely open fire so rapidly when a boat is first discovered in a dispersed beam as they do when a concentrated ray catches the craft. There seems more hesitation in deciding what is seen. Both with concentrated and dispersed beams the water just outside them appears extra dark, forming the 'dark ray' before mentioned. No matter what the state of the atmosphere or the appearance of the sea, boats are absolutely invisible in these dark patches.

The effect of site on the efficiency of electric lights in showing guns their prey does not appear to have received any consideration at all. Our latest experience shows that it is a matter of the greatest possible importance.

FIG. III.

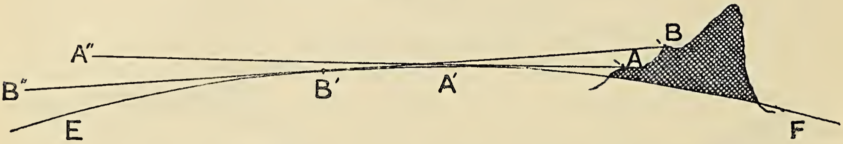


Suppose a battery *B* and two fixed lights *L1, L2,* all low sited. The battery *B* generally sees nothing of torpedo-boats in the sea areas *a, a, a,* no matter how many wandering rays are showing them up, nor does *B* see them if the boats are at *al1* or *al2*. The only chance the guns get of hitting is when the boats actually are crossing the rays or silhouetted in the water area *b, b, b*. If such batteries are working independently they get no warning and the boats are through in a few seconds. The above is a very common form which electric installations for Artillery purposes have taken. Those who have the selection of sites for electric lights can hardly have considered the question from the gun point of view, and until Artillery are permitted to settle the sites both of their guns and of the electric lights, their hope of successfully keeping torpedo-boats at a distance must be more or less forlorn, no matter how large the armament. A small, well sited and well formed armament with electric lights under the same management could dispose of torpedo-boats with far greater certainty and economy than five times the number of guns and lights badly placed and opposed to each other. It seems incredible that such an adjunct to gun fire as electric light should be treated as a thing entirely apart from Garrison Artillery, yet such is the fact!

It is to be hoped that if the chance ever falls in the way of an artilleryman of arranging guns and lights for his defence he will not content himself with the consultation of plans, contours, charts, etc., the fruitful cause of faulty work up to the present, but that he will settle the question on the ground itself by actual trial, the only method affording hope of success. The trial need not be a costly affair, but it must be somewhat prolonged as it must embrace variation of weather. It would repay its expenses and the trouble given to it ten times over in the avoidance of costly and constant changes afterwards. The means required are a dozen or so observers, a torpedo-boat or launch, two portable electric lights, several D.R.F. instruments on tripods, and a few Verey's pistols with cartridges, the D.R.F.'s and Verey's pistols would represent the guns

The manœuvres have very clearly demonstrated that the effective lighting of water areas is not so much a question of brilliancy of ray as of selection of site for the installation and that in siting lights near the sea level the Engineers are in error.

FIG. IV.



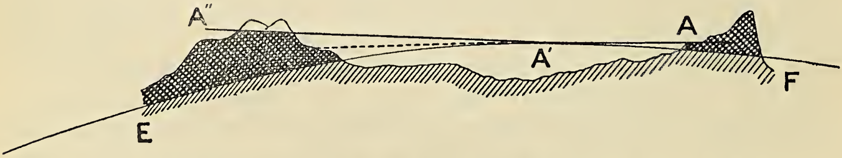
If *E F* is the curve of the earth and there is a light at *A* throwing a ray *A A′ A″* there is a dark portion between *E* and *A′*, which affords a shelter to boats: If now the installation be moved to *B* the range of the light is vastly increased and there is practically no dark space, except possibly close in shore, where generally no light is needed, or if it is can be supplied by a weak instalment flanking the shore, or by temporarily depressing *B*.

Height at which electric lights should work.

The writer has never had an opportunity of using an electric light installed at a greater height than of about 80 feet, and that a weak portable one, but even at this height it appeared to be more effective for gun work than far more brilliant lights lower down. A high installation has not to drive its light through so many layers of dense atmosphere and smoke and it has a much larger target to light up. Trial might show that the higher a light is placed the better.

But another fact was frequently recorded during manœuvres where low sited lights were used which does not seem to have been noticed before and which is much in favour of torpedo-boats.

FIG. V.



The rays were seen to be deflected upwards increasing the dark area *E A′ A″*. Where one light was a few feet higher than the other, it was thought that this deflection was not as great in the case of the higher light as with the lower. This needs further experiment and confirmation. Some mountains, seven miles or so away and 2,000 feet high had their tops brilliantly lit up by a very powerful low sited light, the greater part of their mass being in shadow, yet the light was being employed to show the surface of the water not 1,000 yards away from the light.

Ignorance as to siting electric lights.

It is evident that the knowledge of siting electric lights on shore is in its infancy, and until Garrison Artillery, who really need it for practical purposes are given facilities for taking up the question, it is not likely to grow fast. The Navy, who have constant practice, have learnt to site their lights as high as they can be conveniently worked. There are few fortresses in which they cannot be placed higher than on board ship.

Fighting lights.

Fighting lights, very high sited and at the command of a superintending officer, would add enormously to the power of the guns relieving the wandering beams of the custody of any boat that they found and permitting it to search for others. It is somewhat doubtful if fighting lights would confer much advantage if no high ground is available for either guns or lights, for they would then be liable to blind some of the guns, but repeated trial during manœuvres would discover some sites where they could be used with advantage to the defence.

Light-balls.

Very often parachute fire-balls, or something of that nature, would be extremely useful to give a general view over water areas, but here again a difficulty for Garrison Artillery crops up. Laboratories are no longer at their command and unfortunately ‘fire-working’ is no longer a part of their training, so that the adaptation of artillery matériel to fighting requirements as they arise is practically impossible. The genius of modern Garrison Artillery finds its grave in requisitions on departments. Even the well tried and clever inventions of past artillerymen are being lost to modern use; they are unattainable if not in some store schedule.

A PATROL ON THE ATBARA.

BY

MAJOR G. E. BENSON, R.A.

[A map accompanies this article, on which the *route* taken is shown by means of a white engraved line.]

I WAS strolling in the bazaar at Asmara, the summer capital of the Italian colony of Erytrea, on the evening of 19th March, 1898, when I saw a native passing me with a telegram in his hand. My eye caught my own name on the envelope so I stopped the man and found that it was for me and that he had followed me that day from Az Teclesan, some twenty-five miles back. On opening the telegram, I found it was from Colonel Parsons, commanding at Kassala, and it ordered me to proceed at once to that place for duty, the Sirdar having applied for my services owing to the sickness and scarcity of British officers in the Eastern Soudan. I was at the time *en route* for England at the expiration of a three months leave spent in a tour through Erytrea, and had only arrived at Asmara an hour or two before. However, I at once went to the Italian officer in charge of transport arrangements and thanks to his kind assistance, I was enabled to start at 4 a.m. next day on a Government mule for Kassala, distant nearly 240 miles. My baggage and servant I left to follow on as best they could, as they would take at least a fortnight to accomplish the journey. Riding twelve to fifteen hours a day, and accompained by escorts of native soldiers on foot beyond Agordat, I arrived at Kassala at 8 p.m. on the 24th—good going for that country and at that time of the year, considering the absence of a moon made it necessary to travel through the heat of the day—and I thoroughly enjoyed my dinner in the brigade mess, established in the old factory built by Muntzinger Pasha.

Next morning I was given command of the Arab irregulars and some seventy ancient blacks who looked after about the same number of slave department camels of which barely half were fit for work, owing to mange, sore backs, &c. I also had general charge of the defences and supervision of the patrolling work.

Owing to scarcity of officers, the irregulars had not previously been under the direct command and supervision of a British officer, and therefore there was plenty of work to be done. Some 150 of them had been taken over from the Italians and further companies or bands were in course of being raised in order to bring up the numbers to between 300 and 400 men. To get them all in hand, it was necessary to practice some simple drill and manœuvre formations. For this I decided to invent some Arab words of command, supplemented, whereever possible, by signals, using the whistle and the signals in the Field Artillery Drill book for the purpose. I did this because the words of command in the Egyptian army are Turkish and to adopt them would mean teaching myself as well as the Arabs—a long business—whereas in a short time by the method I adopted, I was able to manœuvre my command to my satisfaction. About half of the irregulars, however, were away on outpost and convoy duty for some time after my arrival and it was not until about April 5th that I got them all together. Then there were their pay and ration accounts to be got square, their arms and equipments to be examined and put right so far as the resources of Kassala would allow. Waterskins were bought and prepared for use, out of funds supplied by Colonel Parsons, and all the waterbottles (canvas, Italian pattern) in Kassala bazaar were bought up and supplied to the men on payment. They, however, only ran about one per three men. I also turned my attention to the slavery department camels and endeavoured to make them more serviceable. They had old pattern saddles which looked as if they had been stuffed purposely to give sore backs, and they invariably did give sore backs when out on a few days patrol. After taking out half the stuffing of the upper part of the panels, there were no more sore backs except when saddles were carefully put on wrong side foremost, which an Arab will sometimes do in the darkness. In short, everything possible was done to render the command available to start for anywhere at the shortest notice and in the most efficient condition it was possible, under the circumstances, to bring them.

The most serious drawback at Kassala, was the want of transport. For all expeditions of any importance, it had been necessary to impress camels from the caravans which were constantly arriving from Keren and from Suakim, but if there didn't happen to be any caravans in Kassala at the time it was necessary to start off an expedition, there was nothing to fall back on beyond the thirty or forty serviceble slavery camels and any odd private ones which could be swept up round Kassala.

We were sitting at dinner on the night of 11th April, when news arrived by wire from the Sirdar, of his victory over Mahmoud on the Atbara on the 8th. This wire was soon followed by another, ordering measures to be taken to intercept fugitives from the battle, who were supposed to be making for Abu Delek or Gedarif. After a short discussion, Colonel Parsons very soon settled that I was to take one company of the Arab battalion—a regular force taken over from the Italians—and all the efficient irregulars and proceed to attack a Dervish post called Rera, about 90 to 100 miles west of Kassala and situated between Abu Delek and Gedarif. From that point I could act in either direction as circumstances demanded. It was not thought probable that the Dervishes would venture to pass so near Kassala as they would have to do if they kept to the Atbara valley *en route* for Gedarif. The latter place, moreover, held as it was by Ahmed Fedil with 4,500 men was too strong to be tackled by any force which could then be spared from Kassala, whereas Rera was reported to be held by some 300 to 400 men only and Abu Delek was too far away to treat as a first objective.

Now came the question of transport! No caravan had been at Kassala for some days and none was expected for several days more. I had calculated that to take three days water and ten days flour for the force in question, together with reserve ammunition and to supply mounts for the sheikhs and my staff and two or three special scouts, eighty-five camels would be required. Of them, barely half could be supplied out of my slavery department camels. Therefore, on that night of the 11th, men were sent out in the direction of the Keren and Suakim caravan routes and to all private owners in Kassala to whip up every camel that could be found. With every exertion, however, the total number including forty-seven Government camels only reached seventy, several of the Government camels of which, I had to take with such sore backs that I am sure the Society for the Prevention of Cruelty to Animals would have prosecuted me, had they had a representative on the spot.

Having to cut my coat according to my cloth, the camel loads were arranged accordingly, and I gave up the idea of taking my servant or any personal baggage beyond what could be carried in my saddle bags. The 12th was a very busy day. There were ten days rations to be drawn from the *nuzl* for 400 men, reserve ammunition for the two kinds of rifles, Vetterli and Remington, fifty-two large water-tins (fantasses) and nearly as many water-skins (gerbas) to be filled from the wells. Camels were to be collected, saddled and apportioned to their respective duties in accordance with their respective physical characteristics. Stuffing and pads were to be adapted for easing the pressure on the sore backs. Add to these, the fact that the news of the Atbara victory had driven every native wild with joy and formed an excellent excuse for the irregulars to go and get drunk—for Mussulmans can get drunk as well as Christians—also the fact that an Arab never does to-day what he can possibly put off till to-morrow, and never does any work which he can get anyone else to do for him, and it will be understood that I and the few who helped me, had a pretty busy time. Fortunately, I was given a free hand by Colonel Parsons, who supplied me with everything I wanted, if he had it, without question. I felt and appreciated the advantage of having a superior officer who was helpful without being fussy. As I had previously called for and examined every weapon said to be defective, and had it exchanged for another from store if there was the least doubt about it, I had flattered myself that, at any rate the mens' rifles were efficient. But far from that being the case, a large number were brought up for exchange at the last moment owing to some small but important defect, such as hair triggers, &c. Also the sheikhs wanted this, that, and the other, and expected me to supply it. However, at last all was ready, and at 5 p.m. we marched out of Kassala, in very straggling array it is true, but we were only going three miles out in order to spend the night and get everything into shape at Tucruf, an outpost of Kassala away from the distractions of the cantonments.

My force was made up as follows:—

	Approximate strength.
One Comp. Arab battalion under an Egyptain Captain ...	102
Beni Amers under Idris Arroda	65
Hadendowas under Mustapha	100
Hadendowas under Minni Ali	35
Shukryas	15
Hassibullah's band (miscellaneous)	60
Self and Staff	4
Medical	2
	383

The Hadendowas and Shukryas were armed with Remingtons, a weapon which missed fire on an average about three times out of ten after all the worst rifles had been picked out. The remainder were armed with a much better weapon, the Italian Vetterli. Many of the men were quite respectable shots and nearly all had seen fighting before. For uniform, the irregulars wore a more or less ancient tarboosh, their remaining garments being decidedly "mufti." The men of the Arab battalion had a white garment and a green cummerbund in addition to their tarboosh. All carried about 40 cartridges per man in bandoliers, some of these, however, being in a very bad state and expensive in cartridges. Other rounds were stowed about their person as best they could. The Egyptian Captain and his command were most efficient and much better disciplined than the irregulars, being organized as regular troops with all the mobility of irregulars—typical of the Italian native troops of Erytrea. Mustapha with his Hadendowas had held Adarama against one attack by the Dervishes and only retired from that place at the end of March when threatened by Osman Digna with overhelming numbers. Hassibullah was a Shukrya—a regular brigand chief—a brave and dashing man though rather excitable. He knew more about desert warfare than any of the others and had been much employed by both the Egyptian Government and the Italians. His company was composed of scallywags from all parts of the Soudan. All these troops were confirmed looters and Hassibullah was a prince at it. The remaining sheikhs call for no special remark. They were good fellows but hardly fit to be trusted with any important job. My staff consisted of (1) Ibrahim, brother of the chief sheikh of the Hadendowas and an old shooting friend of mine before I was taken on for service. He acted as aide-de-camp and proved an excellent staff officer: (2) Sergt. Nicklin, the English N.C.O. of the 16th Egyptian battalion who having obtained permission to come with me, was placed in charge of transport and reserve ammunition and stores. He is a worthy type of Kipling's "Sergt. What's 'is name." He was assisted by (3) Achmet Awad, a most intelligent Arab who was son of the Sheikh of the Algadens, now wiped out by the Dervishes. Both he and Ibrahim spoke excellent Arabic without any Soudan patois, and this was of importance to me with my limited knowledge of the language. I must not omit to mention my chief scout, Adlan, a Shukrya, the finest specimen of a Soudanese Arab I have met. A man of fine physique with a good-humoured black face, he was as plucky and useful a man on such an expedition as could well be imagined. He had been largely employed on intelligence "sneaking" patrols and with two or three comrades, would ride anywhere in the Dervish country, and if he could not obtain information by other means, he would lie in wait at dawn over the wells and seize and carry off a prisoner even from Gedarif itself. Another very plucky fellow who had done most useful scouting work down the Atbara, was little Kurrar, a Hadendowa. He got through from the Nile to Kassala, though Mahmoud with 20,000 men blocked the way on the Atbara. The Medical Department was represented by a young Egyptian surgeon and his orderly.

At Tucruf, owing to want of a commissariat and transport department, I distributed the bulk of the water and rations to the different companies in proportion to their strength. This ensured the camels being looked after and quickened the work of loading up and unloading. Every sheikh was made responsible that the rations, &c., lasted the time calculated.

At 3 a.m. on the 13th, we left Tucruf and with the aid of a partially obscured moon, struggled through the thick bush country of the Gash. The pace was slow, but soon the country got more open, and passing Ebret where there used formerly to be a village, we halted at 9 a.m. The Soudan summer had pretty well begun and even Arabs cannot march during the heat of the day without an immense consumption of invaluable water. Starting again at 4 p.m., we marched till 9, bivouacing in square with camels in the centre and posts each of six men, about 200 yards distant all round. This was the bivouac formation I invariably practised and the troops soon got to form up in their places in the dark without the least loss of time. nI the halt during the heat of the day, the troops were more scattered and outposts further out so that advantage could be taken of any existing shade. The sheikhs took their turn of duty daily to visit outposts and generally perform the duties of Field Officer of the day. All track had disappeared after the first march and thereafter we pursued a north westerly direction in order to strike the Atbara and thence advance on Rera by a route unfrequented by Dervish patrols. The country being open, the marching formation was usually open column of companies, all the baggage camels being with the rear company. Flanking patrols and an advance guard marched from ¼ to ½ mile on the flanks and in front, this distance being, of course, very much reduced at night. At sunrise, the pious ones fell out in twos and threes to say their prayers, but I fear they did not amount to more than ten per cent of the whole, probably the most bloodthirsty of the lot. All were very cheery, however, and it amused me to hear some of the sheikhs chaffing and arguing with each other as to the superior courage of their respective tribes, as we journeyed along.

The ration was 1¼ lb. of flour daily. With this, each man made his two "barkootas" as follows :—A large fire was made and stones the size of one's fist thrown into it. While they were being heated, the flour was made into dough by the addition of a little water. This dough was divided up and each piece worked into the shape of a bag. A hot stone was then thrown into this bag and the dough worked round it on all sides. This ball was thrown into the embers and was soon cooked from within and without. I doubt if any other troops could do the work these fellows did on such simple food, and on one occasion, many of them had to go without even this food for thirty-six hours.

I may mention here that in order to facilitate the rapid delivery of orders, I took an intelligent orderly from each company. These orderlies were with me always and each of them conveyed orders only to his own particular company and then returned to me.

On the evening of the 13th, a column of smoke was seen on the right front in the direction of Gos Regeb, evidently in the Atbara valley. As the valley was practically uninhabited, it seemed likely that the fire was caused by Dervishes; so I sent Adlan to see if anything could be seen of them. He stayed out all night but on his return reported no Dervishes anywhere near us. Next day, more fires were seen, evidently much nearer us. That evening the country changed from a grassy waste to a flat alluvial plain, level as a billiard table, with a few scattered bushes, but no grass. In the clear atmosphere a solitary mountain called Ofrek showed up above the horizon fifty miles to north of us, while Gebel Kassala was still clearly visible about the same distance to our rear. We were evidently approaching the Atbara and hoped to reach it that night. But when darkness came on, we got into some bad ground and after floundering about among some small khors for an hour or so, we had to bivouac where we were. Several men had a thirsty night of it. As probably there were Dervishes not far away, I ordered no fires to be lit nor light of any kind, so as not to betray our presence. Next morning (15th) at dawn, just before starting there was a little mild excitement produced by the near sound of a shot. Every one rushed to arms, but it was soon discovered to be due to one of our sentries firing at (and missing!) one of our own men, whom in the gloom, he mistook for a Dervish.

In advancing on the river, I sent out patrols well away to the right flank, to look for signs of Dervishes. Three-quarters of an hour of somewhat rough travelling enabled us to reach the river, which we found to be only a foot deep and with the slightest possible current. The point where we struck it was about thirty miles north of Asobri. As our march to Rera would take three days during which it would be inadvisable to light any fires, all hands set to work to prepare "barkootas" to last that period. While this was going on, one of my patrols came in with news of Dervish horsemen having been seen coming from the direction of the Nile. A few footprints in the sand of the river bed also showed that Dervishes had recently passed. I now sent out Hassibullah with his company to try and take a few prisoners. At 1 p.m., he returned having had a skirmish with about fifty Dervish horsemen, killed a few horses and taken three prisoners (Baggaras). These on being questioned, stated that Osman Digna, Ali Senoussi (wakeel of Mahmoud), the Sheikh Ed Damer and other Emirs, together with a very large force, were on their way up the Atbara en route for Gedarif, that many of the Dervishes were scattered but that the bulk of them were two or three days march back; that they had been unable to retire to Omdurman after the battle of Atbara by Abu Delek, owing to want of waterskins and camels. Here was an important piece of news! It was at once evident that all idea of going to Rera must, for the present, be abandoned. I decided to place my force across the path of the retreating Dervishes and do the best I could towards capturing them and still further demoralising them. After consulting the map, I considered that Asobri was the best place to do this from, as it was at a slight salient of the river projecting westwards and was therefore a difficult place for the Dervishes to avoid if they kept, as they were likely to do, to the left or western bank. Asobri was also nearer Kassala than my present position, an important point as regards supply and transport, for every drop of water consumed *en route* had to be carried.

Having written to the above effect to Colonel Parsons asking him, at the same time, to forward supplies and any reinforcements he could spare to meet me at Asobri, I sent the letter by the fastest camel I knew of and gave orders for my force to start at 3 p.m. In the meantime, three more prisoners were brought in, one of them a small Soudani boy of about six or seven, clothed in the usual "jibba," whom I annexed, amid much amusement, as my 'orderly.' Henceforward, he rode hanging on at the back of Ibrahim's camel.

At Hassibullah's suggestion, we retraced our steps some miles on the Kassala route before striking south, so that the Dervishes when they saw our tracks, might think we had returned to Kassala. What little there was left of the moon was obscured by clouds, and we had rather a troublesome march southwards owing to the difficulty of keeping clear of bushes and bad ground in the darkness, so it was not until 8 a.m. on the 17th that we struck the river at Asobri after our long detour. The country in the neighbourhood of the Atbara is much cut up by dry khors and hillocks of soft friable soil covered with thorn bushes. These extend for from one to two miles on either side of the river and make it a most difficult country to work in till the open plain beyond is reached. The bed of the Atbara is from 150 to 300 yards wide with steep banks from fifteen to thirty feet in height except where the khors enter the bed. These khors form, therefore, the highways to the river for any man or animal wishing to drink. There are few trees of any size along the river, but the bushes grow thick and almost impenetrable along the edge of the bank. The valley being quite uninhabited, all names simply indicate localities or places where villages formerly existed.

At Asobri I found a half-company of the Arab battalion from Kassala under an Egyptian lieutenant. Previous to my departure, it had been arranged that a body of Halenga Arabs should be enrolled and sent to hold a post at Asobri in support of me when I should return that way from Rera. There had been some difficulty about the Halengas, so this half company, to my great satisfaction, had been sent instead.

I deposited all the baggage and stores in a khor on the left bank and fixed the respective positions of each company, then selected an outpost line and threw out strong outposts as a sort of net to catch any stray parties of Dervishes passing near the river, the sentries being duly warned to keep under cover as far as possible. I also sent out strong patrols to the western desert. It was evident that my operations would be severely handicapped through want of cavalry. I think I would have given anything I possessed for a good squadron of cavalry, but as there was none, there only remained the alternative to do one's best without any. I therefore had all the camels drawn up and selected all which had any claim to be considered riding camels. They amounted to thirty in all and these I handed over to Hassibullah to mount his men on, two on each camel. I also found there were some seven or eight private mules in the Arab battalion and these served to mount one of their patrols. The remaining camels were turned into the river bed to feed under a guard of one man from each company. The other sheikhs were highly indignant that Hassibullah's company should have been selected to be permanently mounted and were pressing in their requests that each company should take its turn at the camels. Having, however, some regard for the wretched camels, and considering that Hassibullah was the most capable leader for that kind of work, I refused their request.

The result of the various measures taken on the 17th was nine Dervishes killed, seven prisoners, two horses and ten donkeys, captured. An emir called Fedil Hassan was reported among the slain. That evening I sent the prisoners into Kassala together with half-a-dozen useless camels. One of the Dervishes told us that towards the end of the battle of the Atbara a follower of Mahmoud endeavoured to persuade his master to flee, but Mahmoud refused, saying he would die where he was. When his follower persisted Mahmoud stabbed him to the heart.

We were also informed that the Dervishes had picked up a considerable supply of dhurra *en route* at Adarama, much of it apparently government dhurra left there by the Hadendowas on their retirement in March. Hassibullah, whom I had sent out about midday, stayed out all night and returned with some prisoners and captured horses next day. I wished to establish posts at the likeliest watering places between Asobri and Fasher in order to keep the Dervishes away from water and pick up prisoners, but after having told off and supplied with rations three parties for this work, I refrained from sending them, as prisoners taken early on the 18th, stated that Osman Digna was approaching with a large force and intended to attack me. This news did not impress me very much as I considered such an attack extremely unlikely under the circumstances, but at the same time, it was well to be prepared. My sheikhs were considerably impressed and poured into my ears all sorts of tales of what might happen, some thinking that Ahmed Fedil would come and attack us from Gedarif (some three or four days away) when he heard of our presence. I was, however, sceptical about this also, as though I knew him to be an enterprising man for an Arab, yet the information we had by our intelligence patrols at Kassala was that he had not sufficient transport to enable him to move a large force in the hot weather. Nevertheless, I decided to carry on a change of camp to a spot half-a-mile further back where the ground was clearer, my first position being taken up more for concealment than defence. This change was carried out on the evening of 18th, a guard being left concealed above the old khor to entrap small parties of Dervishes coming to drink, and a fresh outpost line taken up. On that evening, I assembled all the Sheikhs with Adlan and Kurrar and impressed on them the necessity of sending me news at once of any large body of Dervishes which they might see when out on patrol. I told them that as Osman Digna and most of his party were said to be mounted, our only chance of getting at him was to surprise him either at night or at his midday halt, except in the unlikely event of his attacking us. I sent out Kurrar with a small patrol to stay out and watch the desert track during the night, and ordered Adlan and party to go out for the same purpose in the early morning, warning them especially to send news by their fastest camel. I satisfied myself that they all perfectly understood.

Previous to this, I had had prepared at Mustapha's suggestion, a letter to some Hadendowa sheikhs supposed to be in Osman Digna's retinue, promising Government pardon and perhaps reward, if they could communicate with me and act so as to deliver Osman Digna into my hands, telling them it was hopeless to escape to Gedarif owing to the intervening country being full of Government troops. I proposed sending it by a Dervish prisoner, should more certain news be gleaned as to the favourable dispositions of those accompanying Osman. However, the chance of delivery never occurred and as it turned out there were very few Hadendowas with Osman.

The bag on the 18th was about fifteen Dervishes killed and twenty-five prisoners together with several horses and donkeys. Even when there were only two or three Dervishes together, they would not surrender till one of their number was killed. This obstinacy was invariable throughout and resulted in a considerable butcher's bill.

On that afternoon I heard from Colonel Parsons approving of my action and saying he would send me some men when he could get transport, in the meantime sending twenty-five who came in useful as escort for prisoners. Curiously enough, he had heard from the Itelligence Department on the Nile that Osman Digna had returned to Omdurman *via* Abu Delek. I believe this had been Osman's original intention.

Early on the 19th a prisoner was captured, who stated that Osman Digna with a large party including his or some other sheikh's *hareemat* had watered some miles north of us and had started to march round us during the night, also that Ali Senoussi hearing of our presence had returned northwards *en route* for Abu Delek or Rera. Although no news had been received from Adlan, in whom I placed the greatest confidence, this account was so circumstantial that I sent Hassibullah with his men to the western desert to look for tracks and report, following up and watching Osman Digna's party if he came across it. I supported him by Mustapha and half the Hadendowas, with orders to keep nearer the river than Hassibullah. They started at 8 a.m., carrying as usual, their rations. As it turned out, it would have been better, had I sent only a small patrol with Hassibullah, but I wanted him to take prisoners for the sake of their information, and I did not know his character so well then as I did afterwards. Other prisoners kept coming in from the outposts that morning of the 19th, some of whom contradicted the previous statement and said that Osman Digna was still to the north. I waited impatiently for news from Adlan, with my men all ready to start, taking water for one day and all the flour I possessed. I arranged to leave a half company Arab battalion at Asobri in charge of spare camels, fantasses, &c., with orders to send into Kassala that evening all the prisoners taken, which now amounted to fifty odd, and to continue the usual patrols. At last, at 11.30 a.m. arrived a wounded man from Hassibullah and Adlan, stating that they were in touch with a large force, which appeared to be Osman Digna's, and at the same time arrived a message from Mustapha that he was engaged with another large force. There was no means of sending any orders rapidly back to Hassibullah as the wounded man came in alone on his camel and much time would have been lost by any other men having to look for Hassibullah. I at once had the camels loaded up, and while this was proceeding, wrote to Colonel Parsons telling him the state of affairs and asking him to send provisions and ammunition to meet me at Fasher some twenty miles south. I intended following Osman to within even a day's march of Gedarif if possible, though I fear that would have meant my men eating camels, as the flour would not last beyond the 22nd.

At 12 o'clock we started and after two hours hot marching, picked up Mustapha (whose messenger guided us) on the scene of his fight. He had killed twenty-two Dervishes, all black riflemen (jehadieh) and lost two men killed himself. From the position of the bodies, they must have been at pretty close quarters. The Dervishes had retired towards the river and according to Mustapha had fought stoutly. He knew nothing of Hassibullah. We set out again and I decided to make for Fasher by the direct desert track. I argued that it was evident large bodies of the enemy had marched round us and therefore with my twenty-four hours water supply, I considered that I would either catch them up or march round them while they were watering somewhere. As there was still no sign of Hassibullah, I concluded I would probably come across him in the neighbourhood of Fasher, as since there was no further news of him, it was probable that he was still following up Osman Digna. I, however, left a small post at a watering place which my guide said was called Khor Lebben, but which turned out to be a totally different place some six miles short of Khor Lebben.

Soon after 8 p.m., we bivouacked in the open, of course no lights being allowed. During the night there were two alarms caused by stray parties of Dervishes stumbling up against our pickets, but no one fired except the pickets. Next morning (20th) at 5 a.m. we started, and after a fatiguing march with little incident, we arrived at Fasher at 11 a.m., many men not having eaten since the night of the 18th. Outposts being put out, five prisoners were brought in early in the afternoon. On being examined, they stated that Osman Digna had been surprised and attacked by our people (presumably Hassibullah) about midday on the 19th, when halted for the heat of the day on the river at Khor Lebben, that the Dervishes had suffered severe loss but that Osman Digna himself had escaped on horseback. This news, of course, produced great excitement. Had I possessed any cavalry or camel corps, I would naturally have sent them on to look for Osman Digna, even though he had twenty-four hours start. But having only infantry and those well tired out, there was nothing for it but to stay at Fasher till I could find out Hassibullah's present position and hear more definite news from him. In the meanwhile, my patrols could pick up prisoners from the now scattered remains of Osman's dismounted people.

On the evening of the 20th, several more prisoners were brought in and at 6.30 a.m. on the 21st, Adlan turned up bringing details of all that had occurred. It appeared that he (Adlan) had sent a messenger to me early on the 19th with news of Osman Digna's march, but that the messenger met Hassibullah on his way out, who instead of sending him on to me, cooly annexed him and used him as a guide to Osman's force. Naturally we were all much annoyed to hear this, for, had the messenger come to me, the main body would have started three hours earlier and been in ample time to take part in the surprise of Osman Digna, and with 350 men instead of sixty, the chances are that in such a favourable place for surprise as it turned out to be, Osman Digna would not have escaped and the loss inflicted would have been much greater.

It turned out that Hassibullah had attacked after midday, having divided his small force into three parts and opened fire into the 'brown' from three different directions, after leaving his camels in a safe place with a small guard. Osman was having his coffee under a tree by the riverside and the surprise was complete. There was a stampede and Osman and his followers fled in all directions, taking what horses they could without time to saddle them. Osman got away with a bullet through the fleshy part of his thigh, on a bare-backed horse, (not his own, which was captured). The fact of his being wounded thus, was communicated by three prisoners belonging to his party, taken at different times and places afterwards.* Hassibullah had killed thirty and taken over twenty-five men prisoners and seventeen women, the wives and slaves of Osman and his emirs. Among the prisoners was the Sheikh Ed Damer the chief sheikh of the great Jaalin tribe who was said to have betrayed his tribe to the Khalifa and so brought about its massacre by Mahmoud at Metemmeh last year. Also a Halenga sheikh, a few Hadendowas and four Egyptians, three of whom had been in Hick's ill-fated army, the other being an escaped convict. Among the killed were four emirs whose names I forget. There were also captured twenty-six horses, twenty-seven donkeys, four camels and much loot, including Osman's 'jibba' and chain mail shirt. The performance was undoubtedly most creditable in itself, but I found it hard to forgive Hassibullah for appropriating my messenger. No doubt his great anxiety was to get all the credit of a possible capture himself, together with a reward I had promised if Osman were taken or killed, and as much loot as possible.

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* Information recently received leads me to doubt whether Osman Digna was really wounded.—G.E.B.

After hearing all this, I decided on marching down the left bank sweeping the country and rejoining Hassibullah who had established himself in a khor on the right bank of the river some two miles north of Khor Lebben, where he was much hampered by prisoners. At the same time I had a letter written and sent to the Commandant at Asobri ordering him to send all the spare camels and fantasses, any provisions and ammunition which might have arrived and all prisoners he had taken, to meet me at Hassibullah's camp. Hassibullah was to be ordered by the messenger *en route* by right bank, to send his camels to Asobri to assist in transporting the fantasses, &c. I ordered Minni Ali with his thirty odd men to establish himself at Fasher until further orders, to patrol the country for prisoners and to forward to me any caravan that might arrive from Kassala. I left him four days rations. These arrangements being made, we set off at 8 a.m.

I was obliged to leave behind me two strong patrols of twenty-five men each which I had sent out at daybreak, orders being left for them to rejoin me the following day by the left (west) bank so that they might pick up a few more prisoners. During the march it was evident by the tracks that a considerable body of the enemy had again gone round us, but I felt sure there were still plenty ahead for us to deal with. During the first hour or two, we picked up one or two prisoners. We had only time for a short mid-day halt and early in the afternoon came across a body of about fifty dervishes. I endeavoured to get them to surrender but without success, so I took my men on to attack them in front and flank, and after a short contest, the dervishes gave ground and scattered, the survivors retreating into the thick country by the river, pursued keenly for some distance. I counted fourteen dead bodies, all Jehadieh and we took some prisoners besides. I was much struck with the extraordinary talent of my men for taking advantage of cover. They were somewhat wasteful of ammunition it is true, and so long as the dervishes stood did not see the necessity of leaving their cover for a further advance. This is not surprising as they had no weapon for close combat, and undoubtedly their method was effective in saving them from loss. The dervishes, on the other hand, fired boldly from a kneeling or standing position, but they were very bad shots. Once they drew back, my men followed most keenly and proved themselves most effective in pursuit. When the fight was over, up came Sergeant Nicklin with reserve ammunition and as soon as it was distributed—and such a scramble there was—on we went.

About another hour had passed, when my right flank patrol reported more dervishes on the right front. Riding forward, I soon saw them coming from the bush country near the river, and with a good pair of glasses, could see there was a large body of Jehadieh led by four mounted men. Their numbers seemed to increase largely as they emerged from the bushes and there could not have been less than 250 to 300 of them. I confess, I wished at that moment, that I had a few more men with me, as the total force present with me at that time, did not reach 200 men. However, I had no fear of the result, so I parked the baggage under a guard with Sergt. Nicklin in charge and prepared to attack. Before going further, I wished to try to get these brave blacks to surrender rather than shed any more blood, so I rode forward alone to make friendly signs and note results. They, however, only fired at me so I brought my men up to the attack. The dervishes were by way of marching across our front, so I endeavoured to head them and at the same time attack them in flank. They stood for some time, and bullets flying about fairly thickly, I dismounted from my camel as I did not see the force of being the principal target. I was much amused by my orderlies, who begged me to come and crouch behind my kneeling camel and presently seeing that I was too busy to attend to them, they all squatted behind the camel themselves. I did not for a moment doubt their pluck, but there is no false pride about these fellows and they benefit accordingly.

For some little time the fight remained stationary, but eventually the dervishes edged away towards the desert and my people then rushed forward with a shout and it became a running fight. Several of the rearmost dervishes were cut off and surrendered, while the pursuit of the remainder continued till darkness came on. In this fight, the enemy left about thirty dead, including one leader, and twenty-five captives behind them including two or three women employed in carrying ammunition, also a few horses. Our own loss consisted only of the Yuzbashi's horse which he imprudently brought into the fighting line.

We now made the best of our way to Khor Lebben and after blundering for two or three miles in the dark down the river-bed from that place, sounding the bugle at intervals to attract Hassibullah's attention, we arrived at his bivouac at 9 p.m. pretty well tired out with our day's work. I, however, had now to sit down and write an account of our proceedings which I dispatched shortly before midnight to Kassala by the ever ready Adlan, on a fleet captured camel. Hassibullah was anxious for my approval of his feat, but I could not give it till I had blown him up over the other matter. I believe, however, he did not realise the enormity of his offence and one cannot judge such people by our own standards. I gathered that, allowing for exaggeration, Osman Digna's party must have exceeded 300 men, of whom, judging by the saddles captured, nearly 100 must have been mounted. Hassibullah had some further fighting on the 20th and 21st with other bodies of the enemy and had inflicted considerable loss. He had drawn to him the post I left on the river a few miles north on the 19th.

It appears that some of the dervishes, knowing him, made signs to him to come over and join them instead of continuing in the Government service.

My two patrols from Fasher arrived next day (22nd) with thirty-seven more prisoners, mostly from the bodies we had engaged and scattered on the 21st. They had had several skirmishes. About midday arrived the camels, fantasses and a further batch of prisoners from Asobri, together with a welcome caravan of flour and ammunition; also a letter from Colonel Parsons saying he was sending me a reinforcement of fifty men of the Arab Battalion on fifty camels (impressed from a Suakim caravan) under the command of Captain Wilkinson, the commander of the Arab Battalion. He was sending them to Asobri with a view to their working north from that place. It was a pity that caravan had not arrived at Kassala three or four days earlier. !

I now set to work to get a convoy of prisoners ready, and the afternoon was employed in filling fantasses, counting prisoners and generally evolving order out of the prevailing noise and confusion of the crowded camp. We got the convoy started for Kassala at 5 p.m. consisting of 260 prisoners and some horses and donkeys escorted by about eighty men under the Yuzbashi. This large escort was necessary as some of the Baggaras had been overheard making proposals for effecting their escape. Having got rid of them all, I had my first real wash for several days—with the result that I got fever that night. On the 23rd patrols were sent out as usual, and prisoners brought in stated there were scarcely any formed bodies now to the north of us. That day I got a note from Wilkinson reporting his arrival at Asobri. Matters now looked like quieting down, so I sent orders to Minni Ali to rejoin me when his rations were finished. Wilkinson, however, seemed to be having a fairly lively time and picked up a goodly number of prisoners during his patrols, besides killing several others. On the 25th, I got a note from him stating that a strong body of the enemy had gone past him, so I collected all available men, amounting to only about 100 and sent them out under the sheikhs to do what they could. Owing to prisoners' escorts and the regular patrols, my strength in camp was now much reduced. Every bone in my body was aching with fever so I could not go myself and there was another convoy of prisoners to send off, including batches from Wilkinson and Minni Ali, the latter of whom had turned up the previous day, bringing a small caravan which had come from Kassala *via* Fasher, in accordance with my request. I sent Sergeant Nicklin in charge of this convoy which also took all the rifles and other loot. Just after dark, as I was trying to get to sleep, Hassibullah came to me with a somewhat sorry tale. It appeared they had come across a body of dervishes and after inflicting severe loss and taking some thirty prisoners, they had been attacked by another body. A stiff fight ensued, during which the prisoners escaped and some of our camels were shot, (I had sent out twelve for scouts). Eventually, ammunition running short, our people had retired with a loss of six camels killed and missing and one man wounded. I sent out a reliable man next day to ascertain the enemy's loss and he reported having found about forty dead bodies. The results of the different methods of fighting were very obvious.

It was now pretty certain from the accounts I received, that this was the last formed body to pass and I began to think it would soon be time to return to Kassala. I had orders to leave 100 men in a post at Asobri before returning, and I made arrangements accordingly with Wilkinson. I also sent a small 'sneaking' patrol towards Gedarif to see if Achmet Fedil showed any signs of movement. My fever had now rendered me useless, so on the night of the 26th, I was tied on a camel and taken into Kassala by the faithful Adlan and Hassibullah, leaving instructions for the irregulars to follow next evening unless required by Captain Wilkinson, or unless there were signs of any more dervishes.

The total loss inflicted on the dervishes amounted to :—

350 killed, including several emirs.
580 prisoners, including three emirs.
70 horses
70 odd donkeys
1 mule
4 camels
Captured.

Also much loot, including five flags, large numbers of rifles and other weapons. There were rumours among the other shiekhs that Hassibullah had annexed a considerable sum in dollars taken from Osman Digna, but on being taxed with it by me he stoutly denied it. Later intelligence received from Gedarif, however, proves that the rumour was true.

Of the prisoners, about 400 were blacks, 100 Baggaras, thirty women and the remainder miscellaneous, including several boys. Many of the men were in poor condition, but others, especially those captured from the larger bodies, were stout and strong enough. Most of the blacks medically fit, were subsequently sent round to the Nile to be enrolled in the black regiments. Others were enrolled at Kassala in the Arab Battalion. The Baggaras were kept in chains at Kassala to do dirty work. The disposal of the ladies gave both trouble and amusement. Many of my men were most anxious for wives or servants, so I made out a list of applicants in the order in which I considered they should be given their choice and handed it over to Colonel Parsons. They all rushed at him then, so as he had plenty of other work in hand, he sent the ladies and the list to Sedi Ali, the Sheikh Morgani, well known as the holy man of the Soudan and held in the greatest veneration by the Arabs. The anxiety of the applicants, however, overcame even their reverence and Sedi Ali had eventually to send and ask for a detachment of police to keep the would-be bridegrooms at a respectful distance.

Several of the captured horses died before reaching Kassala. They had had no grain for a long time and were in no condition to undergo a long march without water.

I calculated that about 4,000 dervishes got through to Gedarif.

Though satisfied with the general results of the expedition, I fear it will be true, as a friend of mine said to me the other day "I suppose you will regret not having caught Osman Digna to the end of your life".

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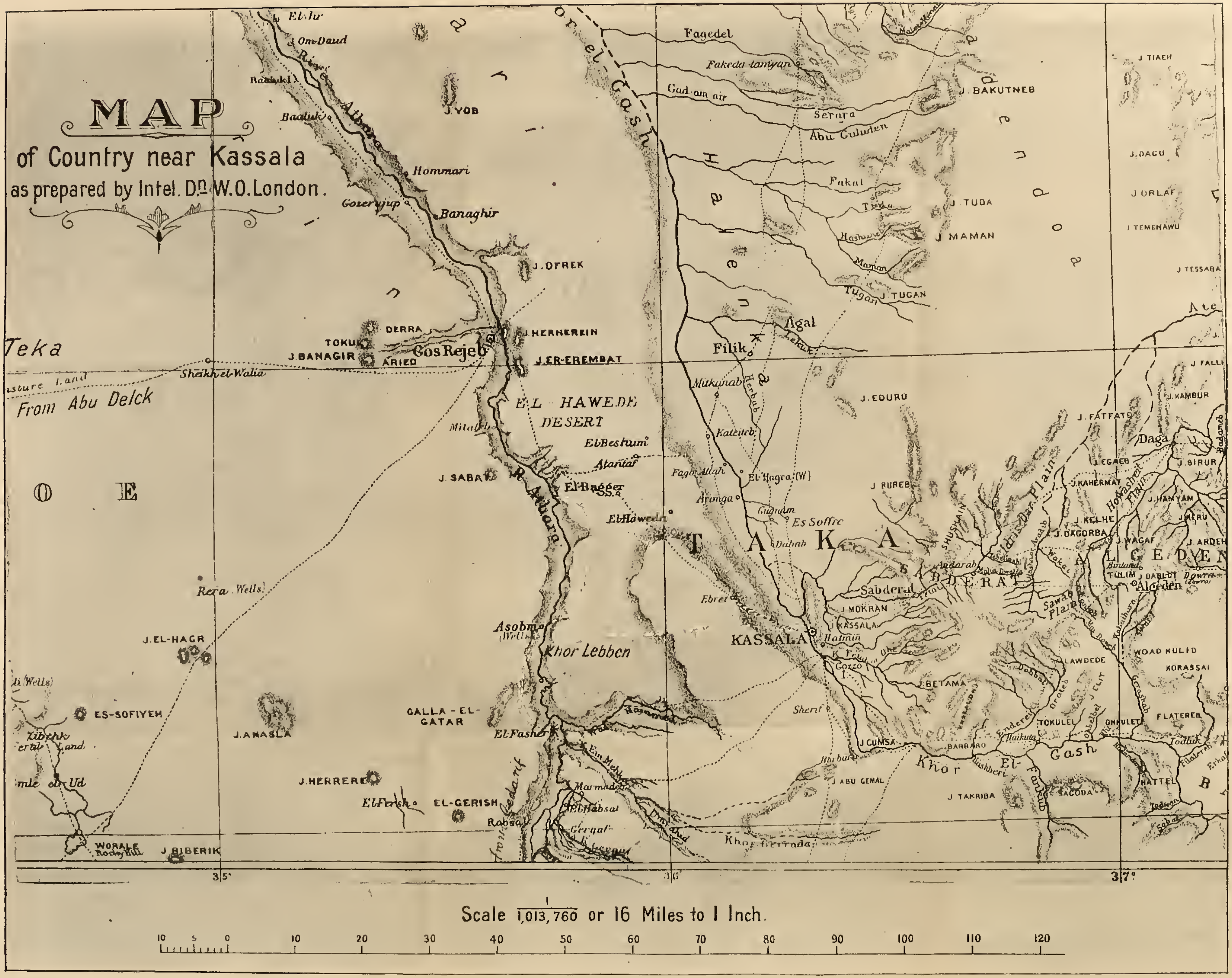

A PATROL ON THE ATBARA.

SOME EXPERIENCES IN EGYPT.

BY

MAJOR F. B. ELMSLIE, R.A.

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Précis of a Lecture delivered at the Royal Artillery Institution, Woolwich, on 10th Nov., 1898.

LIEUT.-GENERAL SIR HENRY BRACKENBURY, K.C.B., K.C.S.I., IN THE CHAIR.

[It is regretted that Major Elmslie's lecture cannot be published *verbatim.* It was illustrated by as many as forty-one lantern slides adapted from photographs taken up the Nile by Major Elmslie, and a few taken by Captain Buckle and Surgeon-Lieutenant Gaine. Without these illustrations the lecture would lose much of its point and sense. Although it is not practicable to re-produce the whole of the photographs, nine of them have been selected for enlargement and printing, and are issued herewith. They will serve as specimens of the style of views with which the lecture was explained and enlivened, and perhaps serve as acceptable souvenirs of an interesting military and historical event.—*Secretary R.A.I.*]

THE lecturer, after stating that the artillery force, which went up the Nile, under command of Colonel Long, R.A. was quite a representative one, comprising two British Field Batteries, the 32nd (Major Williams) armed with 15-prs., and the 37th, armed with 5″ howitzers; one Egyptian Horse Artillery Battery, (Brevet-Major Young) and four Egyptian Field Batteries (Brevet-Major Lawrie, Captain Peake, Captain de Rougement, and Captain Stewart), to say nothing of a Maxim Battery manned by the R.A. (Captain Smeaton) and two 40-prs. R.B.L. (Lieut. Waymouth), went on to describe the journey of the 37th Field Battery from Cairo to Omdurman, a distance of about 1,200 miles. It can hardly be called a march, as the means of progression were so varied and unusual, comprising the ordinary railway, the desert railway, a route march across the desert, Cook's steamers, gun-boats, stern-wheelers, *gyassas* and *naggars.* Sometimes the troops were towed in barges, and at other times they had to tow the barges!

Many inconveniences and hardships were met with on the way, such as overcrowding, exposure to the sun, dangers of explosion, due to sparks from the furnaces of the steamers, alongside which the barges were lashed, risk of being swamped, landing in the dark, bivouacking in the desert, dust storms, rain storms, short rations, light kits and perpetual and heavy fatigue work, but all these were borne by the men in a thoroughly soldierlike manner and they were cheerful and contented throughout.

The Nile was encountered in full flood and it was often with great difficulty that the heavily laden steamers were able to stem it.

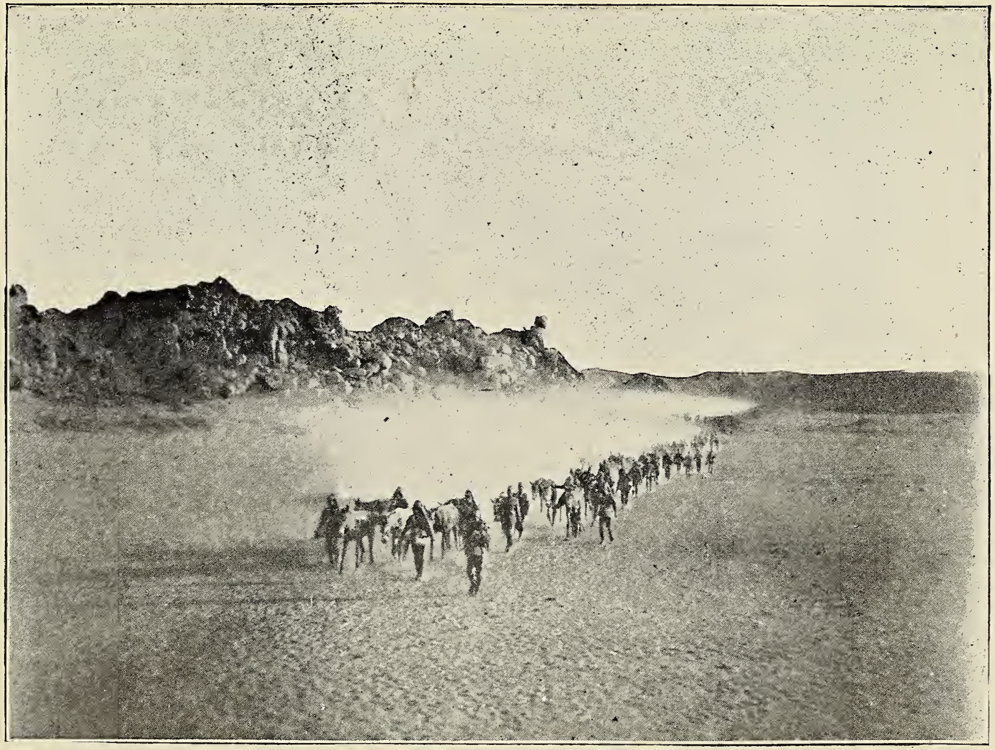
One non-commissioned officer was unfortunately drowned on the way, but eventually officers and men, guns, ammunition, stores and mules all arrived safely at the objective point.

The battery left Cairo on 28th July, and arrived off Omdurman on 1st September, travelling, for most of the way, in company with a Maxim battery manned by the Royal Irish Fusiliers, and two 40-pr. guns manned by the 16th Company Eastern Division, R.A. When the battery went to Egypt the horses and British drivers were left behind in England and mules and native drivers taken on in their place. As regards the latter the Lecturer said "They were a very "nice lot indeed, real good fellows, willing but very stupid and "exceedingly noisy. They were simply peasants—the Egyptian *fellaheen*—nominally soldiers because they wore uniform, but that was "all. We did not get the drilled soldier, as of course he was wanted "up at the front, so we got the last batch of recruits. After a bit "they got into good order and turned out a very serviceable set of "men. I was exceedingly pleased with them, in the end, when they "got well disciplined."

The journey up the Nile was divided, it might be said, into sections and the sections were dealt with differently according as the troops were within the range of civilization, near Cairo, or actually in contact with the enemy.

From Cairo to Khizam the battery and animals proceeded by rail and from Khizam to Assouan in a Cook's steamer towing two barges. At Assouan they disembarked and marched round the cataract to Shellal where they found their howitzers which had been sent all the way by rail from Cairo. The men, mules and howitzers, 40-prs. and Maxims, were then all put in barges, lashed to stern-wheelers and conveyed to Wady Halfa where they took the Desert Railway to Atbara. The officers were accommodated in a luggage van and the men in trucks, while the mules also travelled in trucks, but of the very roughest description. A most interesting account was given of the railway generally and how the engine has to drag its coal and water across the desert.

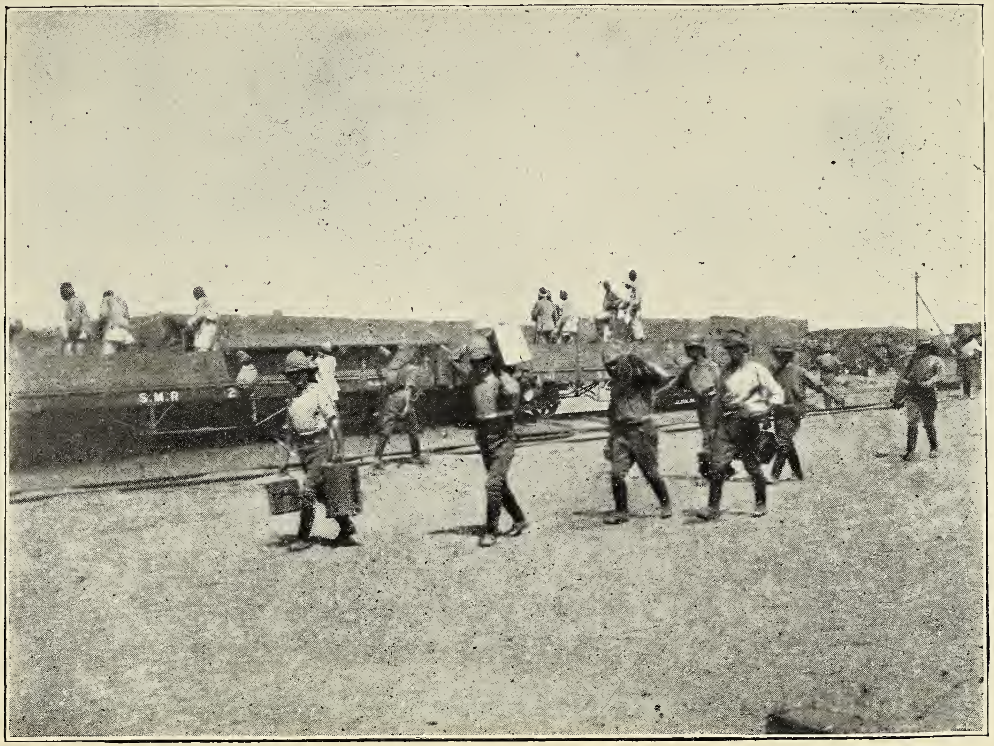
Atbara was the base of operations, and the battery bivouacked there for three days. Here everything in the way of stores and baggage which could be dispensed with, was left, and the mens' kits were reduced to two havresacks, a blanket and a waterproof sheet. The blankets were of a special pattern with eyelet holes, which were of great use such as in hanging them up for a protection against the sun either in the barges or on shore. It was at Atbara the gun-boats were first met with. "Beautiful boats, a pleasure to see!" said the Lecturer. From Atbara to Wad Hamed, the advanced point of concentration, the mounted portion of the battery marched by the bank,



MARCHING IN THE DESERT.

ANIMALS OF 37TH FIELD BATTERY, R.A. AND MAXIM BATTERY NEAR SHELLAL, AUGUST 3RD, 1898.

From a photograph by Major F. B. Elmslie, R.A.



THE SUDAN MILITARY RAILWAY.
MEN OF 37TH FIELD BATTERY, R.A., UNLOADING TRUCKS.—ATBARA, AUGUST 9TH, 1898.
From a photograph by Major F. B. Elmslie, R.A.

(160 miles in 8 days) while the guns and stores were towed up in barges by the gun-boats.

Wad Hamed was the point of concentration for all the troops previous to the advance on Omdurman. The battery remained there several days and had an opportunity of practising the building of the straw huts, or "tokuls," at which the Egyptian and Sudanese are so clever, but at which the men of the battery did not prove conspicuously successful. Shelter from the sun for the men was also obtained by raising two sticks with a cross piece and throwing the blanket over them. In exhibiting some of the subsequent photographs, the lecturer much regretted that, owing to the impossibility of photographing by night, many of the most striking scenes were lost. In the daytime everything looked prosaic, but at night, in the moonlight, the Zareba was a wonderful sight with all the troops lying down on the desert in rows, fully dressed and their rifles at their sides.

From Wad Hamed the battery was carried forward in a barge to Suradab, which is only two marches from Omdurman, the animals marching with the 32nd battery on shore In this section of the journey lay the Shablukah cataract, and, when going up it, the battery had a very nasty time indeed with the water all over the barge. The expedient of lowering waterproof sheets over the bows and holding them there, proved effective, and averted the danger of being swamped. At Suradab the battery received orders, on the evening of August 31st, to advance the following morning at 5 a.m., to proceed with the gun-boats right up to Omdurman, to establish itself on the right bank, and immediately open fire on the place. A force of about 3,000 Friendlies, under Major Stuart Wortley, were on this bank and co-operated. There was considerable fighting with a Dervish force, which was found posted on this bank, but it was finally dispersed, and the battery was eventually landed on the opposite bank of the Nile to Omdurman and almost due east of it. The debarkation was effected with some difficulty, owing to the barge with the howitzers in it not being able to get close into the bank, and it was the worst landing place which had been met with during the whole of the battery's progress up the Nile, owing to the rushing current, and deep soft mud, which got on to the ropes and made them so slippery that the men could not hold them. Fire was opened when five guns had been got ashore, and effects soon became visible on the Mahdi's tomb, which stood some way back from the river. Next day, 2nd September, the bombardment was continued from a point about ¾ mile lower down the river, whence the wall of the citadel could be attacked, and this was breached in three places by the battery with a view of opening a road for the advancing troops. The citadel, some forts, barracks, and other public places, were also fired upon, and cleared of their occupants.

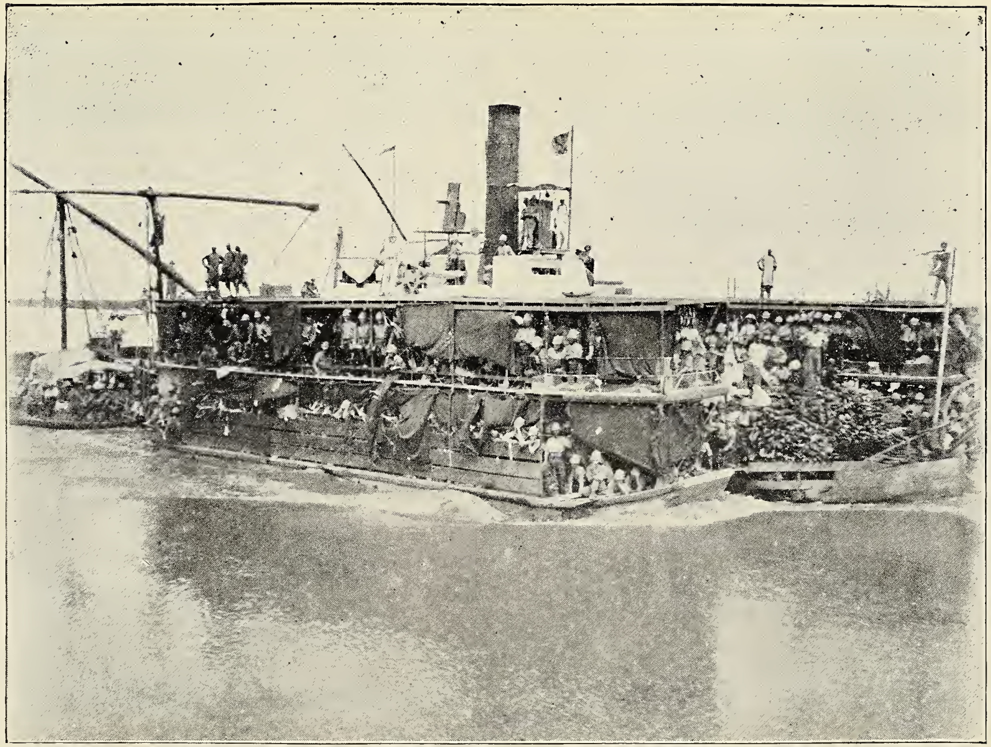
The particulars of the battle of Omdurman and the re-occupation of Khartoum are now matters of history and there is no occasion to repeat them here, but the Lecturer remarked that in his view the main feature of the campaign was the very excellent mutual support given by the different arms to one another. They worked thoroughly together and understood one another. The Artillery were glad to know that the Infantry were at their elbows and the Infantry were glad the Artillery were there, and both relied upon the Cavalry, while all three felt the greatest support from the close presence of the gun-boats, which used their guns and Maxims on every opportunity.

The Lecturer laid particular stress on the excellent services of the gun-boats. They belonged to the Egyptian Government and were in charge of officers of the Royal Navy and a few of them of officers of the Royal Engineers, the whole flotilla being under the command of Commander Keppel, R.N. These boats were the scourge of the Dervishes from start to finish and, when not fighting or reconnoitring were towing troops and stores, a service they performed equally well. The Lecturer spoke with great enthusiasm of the engagement off Omdurman on 1st September when the gun-boats went up the river in single column "line ahead" and when he had the good fortune to be on the leading boat and his Battery in tow of the rear boat. They ran past the Dervish Forts one by one, tackling each in turn, and putting shell after shell into them. They also engaged the Dervish Infantry and Cavalry who appeared in large numbers on the banks, causing great execution amongst them. Men and horses were to be seen tumbling over in every direction. "It was," the Lecturer said, "one of the prettiest fights imaginable, and made the blood run through ones veins to see it."

The technical artillery points of the campaign were fully brought out in the Discussion which followed the lecture, but it may be specially noticed here as well that the 37th Field Battery had the honour of being the first to use high explosives in actual warfare and the very effectual breaching of the walls of Omdurman in three places shows that the choice of Lyddite for bursting charges of shell for this particular service was fully justified. The good results obtained being due entirely to years of patient experiment and work on the part of the Inspector General of Ordnance assisted by the Ordnance Committee and the Royal Laboratory authorities.

The Lecturer specially referred to the good work done by the 32nd Field Battery under Major Williams, whose praises he had heard sung on all sides after the battle. Its fire, he said, was excellent and very powerful, it changed position quickly, and got the range again quickly, and in every way did wonderfully well. He greatly regretted that none of the officers of that Battery were present at the lecture to take part in the discussion owing to its being *en route* for India.

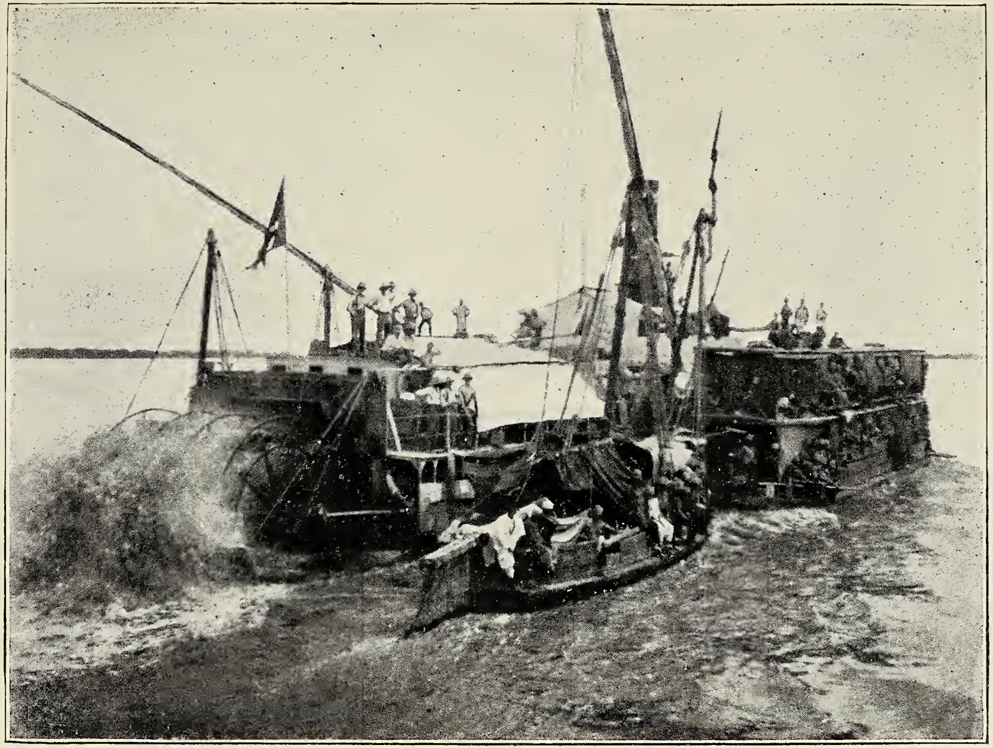
The Lecturer concluded by alluding to the unfortunate disappointment of the 40-pr. guns, which had been brought all the way up the Nile, not being landed at the last, owing to the battle having taken place in the open and their not being required. They were in charge of Lieutenant E. G. Waymouth, R.A., who was naturally keenly disappointed but like a good gunner found some other work to do. He landed all his men, converted his barge into a hospital, and assisted by his men applied first aid to about 150 wounded men on board



BREASTING THE NILE.

STERN-WHEEL GUN-BOAT WITH BARGES AND *GYASSAS* FULL OF TROOPS LASHED ON BOTH SIDES, NEAR SHENDY.--AUGUST 15TH, 1898. BOW VIEW. THE OFFICERS ON THE GUN-BOAT, MEN ON THE BARGES. BLANKETS HUNG TO KEEP OFF THE SUN.

From a photograph by Major F. B. Elmslie, R.A.



BREASTING THE NILE.

STERN-WHEEL GUN-BOAT CONVEYING TROOPS UP NILE. STERN VIEW. NEAR SHENDY.
AUGUST 15TH, 1898.
From a photograph by Major F. B. Elmslie, R.A.

it, for which service, it is gratifying to learn, he was mentioned in despatches.

Here the lecture terminated and the Lecturer resumed his seat amidst loud and prolonged applause.

DISCUSSION.

The CHAIRMAN: I have had a list given to me of officers present whom we should all, I am sure, be delighted to hear, if they would give us some account of their experiences. The first name on the list is that of Captain Dawkins, R.A., who was staff officer to Colonel Long at Omdurman.

Captain J. W. G. DAWKINS, (staff officer to Colonel Long, Commanding the Artillery at Omdurman): Sir Henry Brackenbury, ladies and gentlemen, I have been asked to give a few notes as to the equipment and matériel of the guns and batteries other than those which have been explained to you by Major Elmslie. To start with the 32nd Field Battery, that battery like the 37th left all its horses behind when it went up to the front, the guns were drawn by mules; eight mules was the normal team to a gun, increased to eleven on an emergency or when the gun came into action. The eight mules were hooked in by pairs with three extra mules hooked in between the three leading pairs. The wagons also were left behind, all the ammunition which should have been carried in them being carried on camels and extra mules. I may say that they found the guns about as heavy as they could bear—no heavier gun could have been used with that system of draught and in that heavy country; they were heavy both for the animals to draw and for the men to work; they had the full detachment of nine men for each sub-division. As regards the Egyptian Field Batteries (I leave the Egyptian Horse Artillery to Major Young who is here) they were commonly called Field Batteries, but they are in reality more Mountain Batteries than Field; they are armed with the little Maxim-Nordenfeldt gun, a gun which works in a jacket and has hydraulic buffers and springs to check the recoil and bring it back into position; they are usually carried on mule's backs, not draughted at all, though they can be drawn by two mules. The loads are distributed—one mule carries the gun, that is to say the gun itself. One carries the jacket and two more carry the wheels and the trail. Those guns also had a full detachment of nine men to work them. As regards the rate of fire of those guns, the ammunition, etc., they are not what we call quick-firing guns at all; that is to say there is no man who sits on the trail and works them from the shoulder, and there is no spade or other arrangement to stop the recoil, but the recoil is not very violent, and owing to these large detachments they can get through very quick, and an officer tells me their normal rate of battery fire is about five seconds per round. The ammunition is fixed ammunition, the cartridge and projectile all in one. I think that is all about the matériel and the rate of fire. I may mention that there was no inconvenience found from those brass cases which I have often heard urged as an objection against them; but then, of course, there was no limbering up. These Egyptian batteries carried common shell as well as the ordinary shrapnel though they did not use very much of it. In one case there were some Dervishes who got in a little near, about 600 yards in front of the British position, who had to be shot at by the batteries and for that they used common shell. The expenditure of ammunition in those batteries was very large, especially one battery, the 4th Egyptian Battery, commanded by

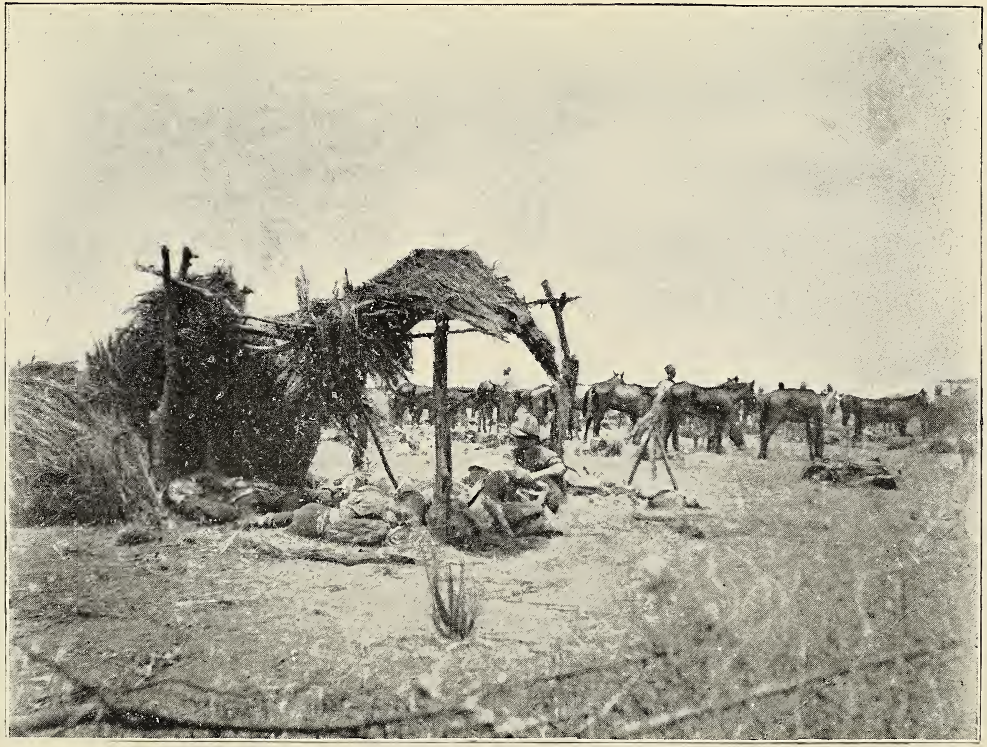
Major Lawrie, which fired no less than 913 rounds—that is over 150 per gun. As regards the supply of ammunition each battery, the 32nd Battery and all the Egyptian batteries, carried 100 rounds per gun with them, that is to say with the gun and on the mules accompanying the gun. We had the ammunition column carried on camels, also carrying 100 rounds per gun all round, and besides that we had on barges close up to the Zareba 200 rounds per gun. We found the ammunition supply work well on the whole. The battery I spoke of, Major Lawrie's battery, was delayed at one period—that was during the attack on Macdonald's Brigade. I may say that that attack on Macdonald's Brigade was supported by three of these Egyptian batteries who marched with it and came into line with it and bore as much of it as anybody else. Well, that battery had to wait a few minutes for its ammunition, but it managed to get some from the battery alongside of it, and by the time the action was over its own ammunition had come up, and when we moved off after the battle all the batteries were full up with their 100 rounds per gun. I think that is all I have to say, sir—(applause).

The **Chairman**: The next name on my list is that of one whom I am sure we all welcome very heartily, that is Commander Colin Keppel of the Royal Navy.

Commander **Colin Keppel**, R.N., (Commander of the gun-boat flotilla) (loud applause): Sir Henry Brackenbury, ladies and gentlemen, on coming here to-day I had no idea, as I think Major Elmslie will bear me out in saying, that I should be requested to speak. I cannot, however, plead that in itself as an excuse as I am sure that if I had had any length of time to prepare I could not add in any way to the great interest of Major Elmslie's lecture and the way in which he described all that we did in the most flattering way in the gun boats. I was in a very good position for seeing the actual attack on the Zareba at Omdurman before the advance afterwards took place. The gun-boat was very high and I could see from the top very well—we could see the whole scene in comparative safety and look on, and it always struck me afterwards that in the newspaper accounts sufficient was not made of the artillery fire. I should say that certainly in my humble opinion the Dervish force was broken entirely by the artillery fire. It was very open ground—I should think for 2,000 or 3,000 yards you could see in all directions and these men came on in a dense—I do not know quite enough about military tactics to describe it—but in a sort of line of columns—I should say dense columns, but moving in line, and at somewhere about 2,000 yards, I think I am right in saying about 45 guns opened fire on them together. I think I need not tell any officer here what that means with shrapnel shell bursting as it did amongst those fellows. There is one other point that I think Major Elmslie did not dwell upon sufficiently, and that is that we were very much impressed in the gun-boats with the wonderful accuracy of the fire of the howitzer battery (loud applause). I do not know the exact range, but I am sure it must have been somewhere between 3,000 and 4,000 yards; we were going up round Tuti Island that we saw just now, and we naturally watched with the greatest interest the howitzer battery. We could not see the gun firing because of the smokeless powder used, but we saw the enormous explosion just over the tomb and the very next shot went right into the middle of the tomb. I think that will explain what their accuracy must have been. I thank you for the honour you have done me in asking me to speak (applause).

The **Chairman**: I now call upon Major Hunter-Blair, who commanded the battery of Maxim guns at Atbara.

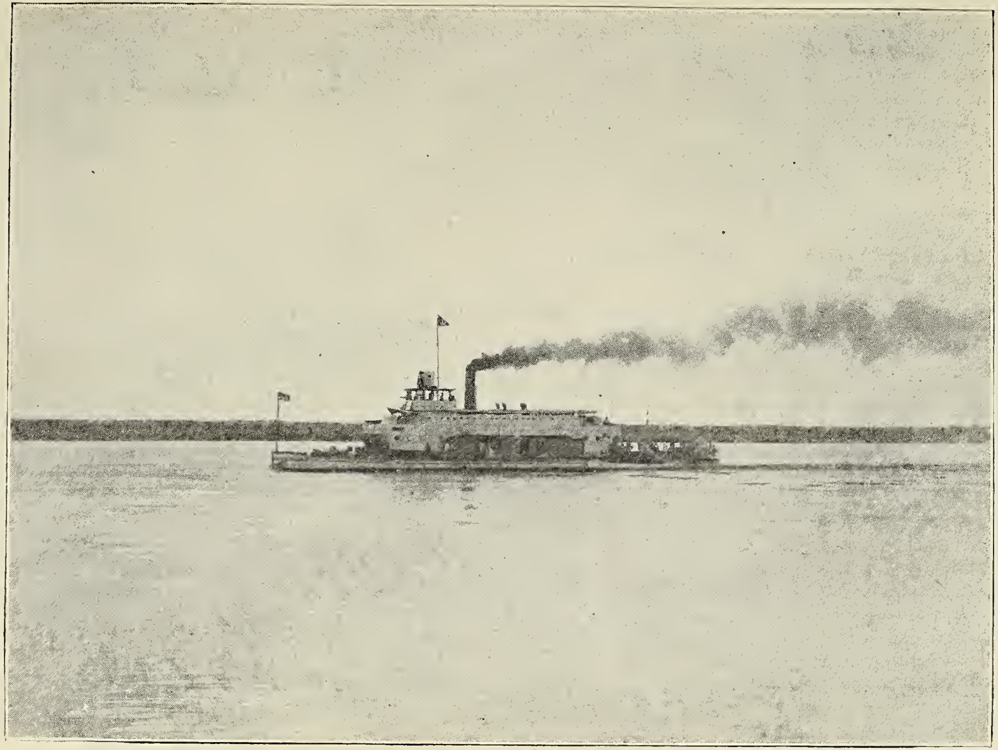
Major W. C. **Hunter-Blair** (commanded the battery of Maxim guns at Atbara): Sir Henry Brackenbury, ladies and gentlemen, my experiences in the late campaign were confined to the period up to and including the battle of Atbara,



MIDDAY IN THE SUDAN.

MEN OF 37th FIELD BATTERY, R.A., SHELTERING FROM THE SUN UNDER ROOF OF STRAW.
WAD HAMED, AUGUST 26th, 1898.

From a photograph by Major F. B. Elmslie, R.A.

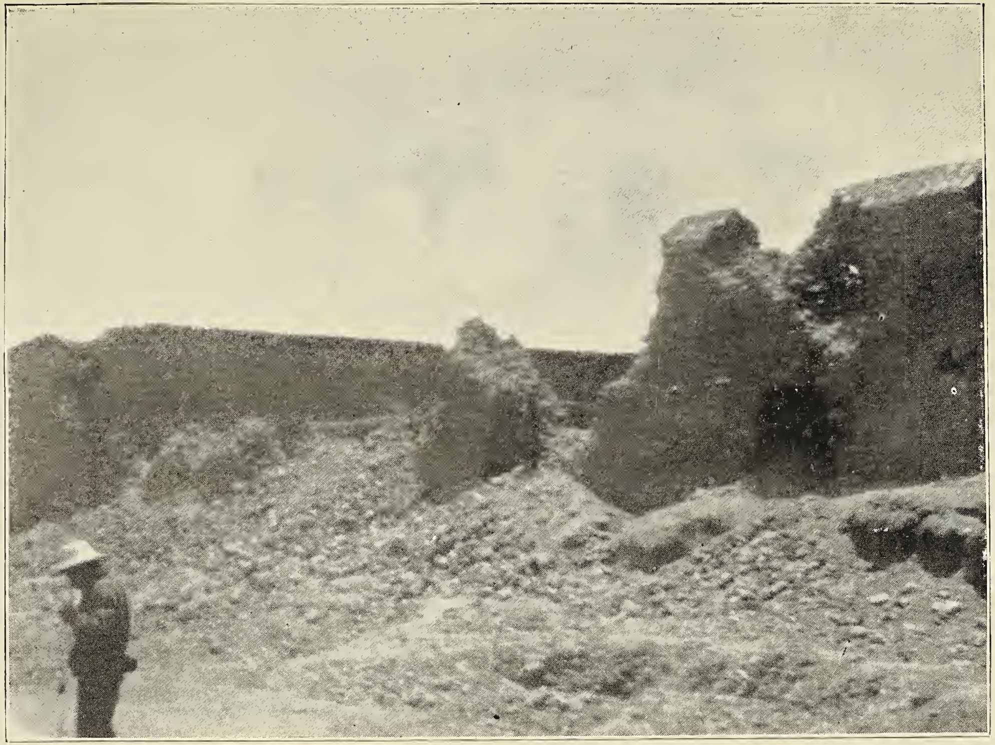


THE GUN-BOAT FLOTILLA.

COMMANDER KEPPEL'S FLAGSHIP *SULTAN* GOING INTO ACTION NEAR OMDURMAN.—SEPTEMBER 1st, 1898.

From a photograph by Major F. B. Elmslie, R.A.

as after the battle of Atbara I was, much to my grief, ordered home, and did not return. The unit which I commanded was in one sense a unique one, because I believe it is the first time on record that Maxims to the number of six, as they were on that occasion, have been brigaded or brought together in one battery; and also I believe it is the first time (though I am open to correction on that point) that machine guns have ever been officered and manned entirely by the Royal Artillery on service (applause). At the beginning of January, when I was captain of the Garrison company in Cairo, I was ordered to form a Maxim battery to go up and join the British brigade. We robbed the three infantry regiments in Lower Egypt, much to their disgust, of all their Maxims—all we could then get were six—and we took these; I selected a detachment of my own company and we left Cairo for the south about a week afterwards. The six guns were mounted on infantry travelling carriages. We had altogether 35 non-commissioned officers and men, and the compactness and utility of the unit I think will strike you when you think that with that comparatively small number of men I had under my command, a unit with fire effect equal I think to about two battalions of infantry. We left Cairo and went up the river as Major Elmslie has described to us this evening, part of the way by boats and *gyassas* and part of the way by the Sudan Military Railway, bringing us up through Halfa where we stopped for some time and then up to join the British brigade at what was then the terminus of the railway at Abu Dis; the railway was then finished no further than that, or rather ten miles beyond it. The two most interesting portions of that part of the campaign, that is before the final advance on Omdurman, were, first, of course the battle of Atbara itself, and, secondly, what I think was no less a test of our endurance, the march which the British brigade did from Abu Dis up through Berber to Dabeeka. That march we began on the 25th February, a Friday. After having done that morning, an ordinary route march of about 17 miles, we left that evening for the front at about three hours notice. There at Abu Dis we dumped the whole of the camp equipment down in the desert and left it lying. That was not the only place where we did that, because every few days we found that we could not carry what we had and we had to dump down some more, so that when we got up to Berber we had at intervals baggage lying all along the route. I may say that it all turned up eventually, a fact which I think reflects great credit on the Egyptian transport organization. The march, which you probably all know about was, I think, rather a fine record. The first night after the ordinary 17 miles route march we did about 17 miles, and then the General got a telegram from the Sirdar saying that Mahmoud had started to come down from Shendy to attack Atbara, and he wanted us to come up with all possible speed and if possible to arrive there by the following Wednesday. The General sent for us and told us what we had to do, and on the second night we did a march which we were told would be about 19 miles and a very trying march it was. We started about 9 o'clock and marched till about 12 along a fairly good road; then we halted for about an hour and then marched from about half past one till about half past five down what they call a " khor " in Egypt, a sort of sandy nullah with most awful deep sand and tremendous dust, and as there were three regiments in front of us we got the full benefit of the dust and stuffiness of it. When we got down to this place about half past five in the morning we halted for another hour, and then we had by way of a little variety five hours along a terrible rocky desert, where I thought the wheels of my Maxims were coming off every ten minutes. Eventually we struck the river and thought we had come to an end of our labour for that day, when the General came up and told us that we had come to the wrong place and we we had got another five miles to do. Eventually we got into our bivouac at about half past 12, having marched with three halts since 9 o'clock the night before and the distance covered was 31 miles, instead of the 19 which we had been fondly led to expect. We started again at two o'clock the next morning and marched, with a halt during the heat of the day, 24 miles. The next day we started at half-past three in the morning and with a halt at mid-day we marched 25 miles, and when we got to this last place we got a telegram from the Sirdar to say that Mahmoud had delayed his coming down and we might have a day's halt, which was very welcome. We started next day at half-past three again and marched through Berber where we had a fine reception from the Egyptian Army, who were all quartered there, and arrived at our destination, Dabeeka, at about eight o'clock that night. We did on the whole five day's marching, (not counting the route march on the Friday) with one day's halt in between, and the total distance was about 122 miles (applause). That was, of course, very trying. There was one rather amusing incident that happened to us personally on that march. On the day after we had that halt before we marched into Berber we lost a gunner. We were to march off at about half-past three, and at three o'clock we were putting in the mules, and one of the mules (as mules will do) kicked himself free from the ropes and broke loose in the dark. I had to send off some men to look for him and the mule (as mules do again) was playing about and could not be caught. The General came down in rather a state one way and another (laughter), and said: "What are you waiting for: Why is the Maxim Battery waiting and keeping the whole Brigade waiting?" I said "I am very sorry, Sir, but I have lost a mule." He said "You must come on without the mule and I will send someone afterwards to look for him," I said: "Very well Sir." I sent to call in all the men who were looking for the mule, and we were just going to move off when one of the Nos. 1 came up and said: "Gunner Baker has not yet returned, " I said: "Where has he gone?" He said: "He has gone to look for the mule and has not come back again, I said: "This is rather a serious matter, we must look if we can find him." About five minutes afterwards the General came galloping down again and said: "What is the Maxim Battery waiting for now?" I said: "I am very sorry, Sir, but I have lost a man now." He said: "Well, you must leave the man, the Battery must come, and we will send back to look for him afterwards." Eventually we marched off without the man or the mule. The mule came on and followed us up and was caught, but the man was not found again, for about five or six days. The unhappy man according to his own story (which we never had an opportunity of verifying) had gone out to look for the mule and had fallen into a hole and became insensible, and when he came to, he found that everybody had disappeared,—the whole Brigade had marched off and he was left alone. I must tell you that the day before there had been some talk of our getting into touch with the Dervishes. It was not a likely thing to have happened, but the men were very much excited about it and thought that every native they saw on the skyline was a Dervish. The consequence was that this unhappy man when he woke up was in desperate terror; he thought he was bound to be discovered by the Dervishes, but he very wisely thought the best thing to do was to get down to the river, then unfortunately instead of turning up stream and following the Brigade he turned down stream and headed for Cairo, so he walked further and further from the Brigade instead of nearer, and he was found some days afterwards, having suffered awful privations, because every native who had heard that he was missing, tried to give him food and he thought they were all Dervishes come to slay him. He was found eventually, by a Sergeant of the Egyptian Army in the gunboats, standing up to his neck in water surrounded by natives all trying to help him out (loud laughter).



THE GREAT WALL OF OMDURMAN.

EFFECT OF FIRE OF THE 37TH FIELD (HOWITZER) BATTERY, R.A., ON THE GREAT WALL OF OMDURMAN.—SEPTEMBER, 1898.

From a photograph by Captain A. S. Buckle, R.A.

Well, after we got into Dabeeka we had some time to wait, and the next three weeks or so we were moving slowly up country expecting to come in contact with the Dervishes every day and never doing it until the 6th of April, when we eventually moved out of camp and marched out to attack the Dervishes' position which we did on the 8th of April. We marched along the river three miles and then out into the Desert through the night and arrived in front of the Dervish position in the morning. There we halted for about two hours and then advanced on to the position. I do not know that there is anything beyond one interesting particular that I can tell you about the Battle of Atbara. I think about the most interesting thing I saw there was the Artillery fire with which the battle opened. I was on the extreme left of the whole line, and the guns were all massed together on the extreme right, and they were firing across the line, so to speak, into the Zareba and the effect of the shrapnel, so far as one could see, was something beautiful. The Egyptian gunners might well be proud of the practice that was carried out that day. I never saw anything more beautiful than the way the whole Zareba, a very long line, was covered from end to end with bursting shrapnel. The actual result of the fire it was of course difficult to say, because nobody got inside the Zareba to look till the infantry got in and they had fired by that time a good many rounds and it was difficult to say what was the result of the infantry fire and what was the result of the artillery fire; but judging from the way the shells were bursting it must have been very considerable (loud applause).

The Chairman: I will now ask Major Young to speak who commanded the Egyptian Horse Artillery Battery.

Major N. E. Young: Commanded Egyptian Horse Artillery Battery (on active service for the last two and half years) Sir Henry Brackenbury, ladies and gentlemen—I am afraid I must ask your indulgence which Major Abdy has kindly promised me as this is the first time I have ever tried to speak in public. What I have to say is of very little interest I am afraid to the Ladies, being purely technical matters. First of all, I wish to say how I found the very great necessity of a very light gun for Horse Artillery. We were constantly called on to make very long marches such as that march which Major Hunter-Blair has just described, which we covered in 73 hours, and we had to do it all at a walk. It was hot weather and very often we went long distances without water. Also in accompanying cavalry on the reconnaissances on the Atbara business, besides the fighting, we had to cover distances up to 25 miles without water in the hot sun, and it was very trying. We had eight horses in the teams, little horses. The gun that I had was one of 20 cwt. behind the teams; it was a *Krupp* gun throwing a shell of about 9 lbs., but it got very heavy at the end of those days. I found that percussion shell of some kind was almost absolutely necessary to be used against savage horsemen, so quickly do they alter their formation and scatter or retire or move the moment you fire at them, so that once you loaded with time shrapnel, if they moved the shell had to be fired, and very often they were quite useless. With the new Maxim-Nordenfelt gun that will not be the case, because the shrapnel can be unloaded again, which I think is a very great advantage of these quick-firing guns. We found also the very great labour of running up. The men sometimes got extremely tired, and on the top of that Kerreri hill, the men found it very heavy work. It was very rocky ground and if we could have fired without running up so often we should have done more execution, because one has not many men to work the guns in the Horse Artillery, and they get extremely tired. A non-recoiling piece, at least it recoiled very little, with which the Field Batteries were provided, they at any rate felt the advantage of. There was no inconvenience from empty cartridge cases, and so all the officers assured me in those batteries, and they were entirely pleased with that gun so far as the work they had to do. I do not think that they considered that it was altogether a mountain gun, but so far as the work went they were pleased with it. The automatic Maxim rifle, mounted on a galloping carriage with six horses in it, and mounted detachments as well, we found of great use on these reconnaissances at Atbara,—which was the only time it was really brought into play with cavalry, especially during retirements when they could be fired without unlimbering, and even on the move, so that you could keep up your fire the whole time; but I should say that the carriage as it is provided in the Maxim-Nordenfeldt Company—the last two they sent out—had to be altered to admit of firing while still limbered up—the muzzle of the gun had to be raised. That is easily altered. But of course we had no experience of their use when exposed to hostile artillery. Maxims and guns I believe are of the greatest possible value in the very front line, in the line of infantry during attack on positions, and it is only by that immense superiority of fire, which they aid very much in getting, that bodies of troops will be taken in to the assault in these days. My own battery did not, what the other batteries and the Maxims did,—go right in with the line to the Zeriba, and the infantry I know were very pleased to see them there. The results of the Artillery fire I think were all that we could desire. At the Atbara I noticed great clouds of dust in the Zareba, and I am sure that was the result of a very large number of people leaving the Zareba before the shot was launched. I am certain that when the infantry went in, and I went in with them they did not find 20,000 men in there or anything like that number of Mahmoud's Army; and so far as the actual material results went, I believe the great number of camels, donkeys and men killed, lying at the bottom of the deep trenches, must have been killed by the shrapnel fire—nothing else could have done it. At Omdurman the great effect on their masses in the open cannot be exaggerated, but that has been better described already. Then there is the question of the proper place for wagons of Horse Artillery—I had never been taught practically, and I have never seen wagons of Horse Artillery at home taken out in the field, and when I went out there and had to move the wagons I did not know what to do with them. I looked at the Drill Book. The Artillery Drill Book says that they should accompany the Cavalry Reserve Ammunition Supply; if you go to the Cavalry Drill Book you find the Reserve Ammunition Supply should be with the Artillery wagons; but I do not know whether it is expected that the Cavalry Commander shall give them a separate escort or whether the Artillery Captain is to take the chance entirely unprotected. I kept my wagons just behind my guns as we did in Field Batteries when I joined the service. I think that is all I have to say except that the one lesson above all others impressed upon my mind by these two and a half years campaigning is the uselessness of all this material, beautiful guns and shell, if the men are not good. It is the military virtue that is the quality we have to educate and look to, without which they are of no use (applause).

The CHAIRMAN: General Maurice will you say anything?

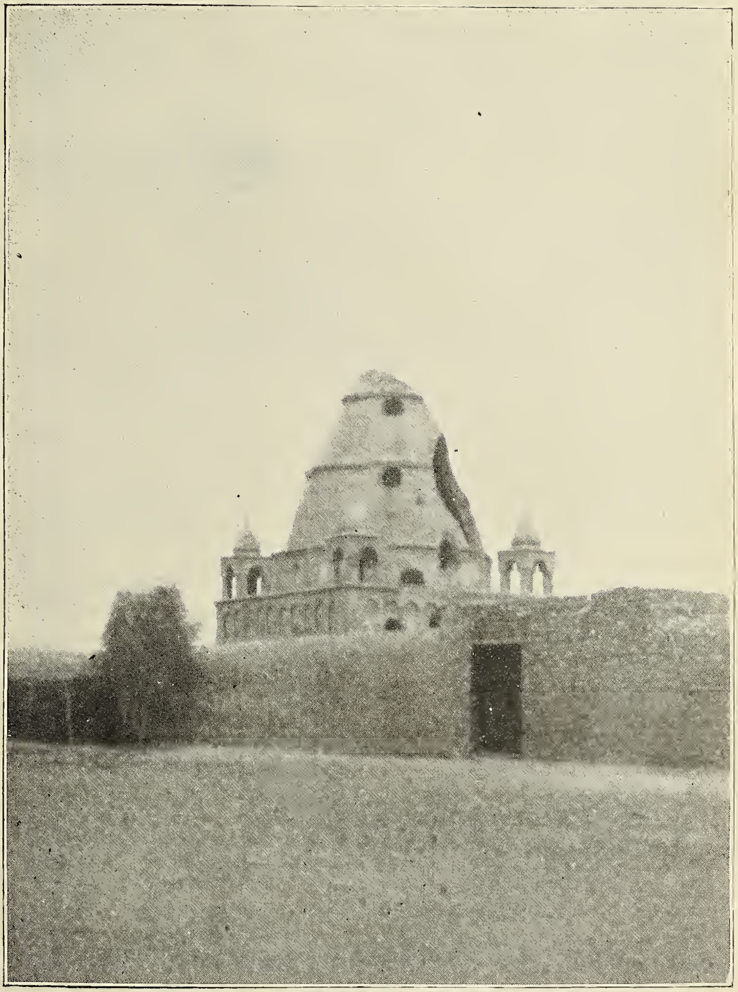
Major-General J. F. MAURICE, C.B.: I think, Sir, it is much more interesting to hear experiences from those who have been out.

The CHAIRMAN: I will ask the Secretary to read a letter from Colonel Villiers Hatton who commanded the Grenadier Guards throughout the campaign.

The Secretary read as follows:—

"It is a most difficult thing for anyone to say how the effect of the various "fire should be proportioned.

"But it appeared to me from what I saw that the Artillery fire throughout was "most effective, and that the range was got almost at once. It was steady and



THE MAHDI'S TOMB AT OMDURMAN.
AFTER BOMBARDMENT BY THE 37TH FIELD (HOWITZER) BATTERY, R.A.
From a photograph by Captain A. S. Buckle, R.A.

"continuous, and, (here of course, I am alluding to the 32nd Field Battery) "another most important matter was that we were able to obtain the range direct "from the guns.

"This not only 'gets on' the Infantry fire at once, but gives confidence, because the men *know* they are right when they see the shells go home and feel "that from those very shells they get their own sighting.

"Of course this is not always possible, but at Omdurman the guns and infantry were so close that it was easy to obtain an obviously successful range—the "long range fire of the Infantry seemed to me wonderful, and we had all ranges "from 1,200 yards in, taken ready the night before. Here again it is difficult to "say how much damage was done by Maxims. I *suspect* their fire to be more "efficient at shorter ranges. It is to the mutual support afforded by the (necessarily) close action of guns, maxims, and rifles that I attribute the great accuracy "of fire, and the fire was even more accurate than at first appears, because (I believe I may say) very many of the wounded had many more than one bullet in "them. I know of one Dervish described by my medical officer as having nine "separate bullet wounds and another with four. If then you take 30,000 as put "out of action by fire wounds, and take 20,000 as the infantry's share, you see "what a large number of bullets found billets.

"In the counting you may put quite three bullets down a man.

"My own Battalion fired with six companies in the firing line, 32 rounds per "man for the first phase of the fight.

"In several places we again got our range from the guns. It should not be considered that at *long range* infantry fire, one bullet is likely to kill or wound more "than one man, because of the fire angle.

"I hope this won't bore you, but the fire effect was so great as to modify *my* "idea of tactics. More than ever will 'ground' and a 'general's eye' come in.

"Yours, &c.,
V. Hatton."

The Chairman : Major Elmslie, would you like to make any remarks now on anything which has been said by any of the other speakers?

Major Elmslie : No Sir, there is nothing that occurs to me particularly. I do not think there is anything more to say, if anyone likes to ask any questions I shall be happy to answer them.

The Chairman : Now ladies and gentlemen, there are but a very few minutes left to us. I think it is Byron who says that

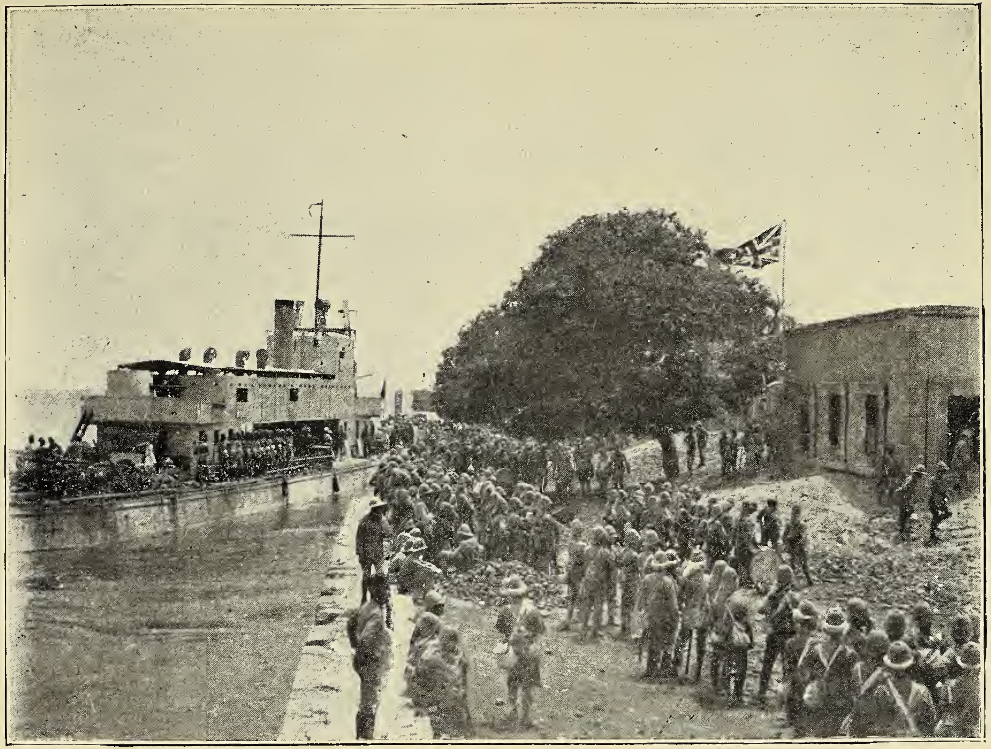
"Happiness for man, poor sinner,
Since Eve ate apples much depends on dinner"

We have arrived at the stage when our happiness begins to depend on dinner, so that I will only say a very few words. I cannot help thinking it is rather a pity that this lecture, which really has treated of a very interesting subject in two distinct ways, has not had two days allowed for it. There is the popular side, the extraordinarily interesting and delightful picture which Major Elmslie has given us of the Campaign, (applause) and there is also the technical Artillery side of the question which it seems to me we really ought not to discuss in a mixed audience like this consisting of both sexes, because it is infinitely dull and tedious to one of the sexes, and I think it would be a pity if we have no opportunity of discussing separately that subject which is to us gunners so intensely interesting. I would therefore suggest now to the Secretary that there should be a day set apart to raise the subject of the actual Artillery work that was done in Egypt and to discuss it separately, when we could hear all about it in greater detail without the presence of the ladies (applause). All that I would say to you now is this: I ask you to join with me in giving a most hearty vote thanks to

Major Elmslie. I think that General Maurice, Colonel Slade, and others who like myself have been in Egypt and know what that campaigning life is, must say that we could not have had a more graphic description of that life put before us (applause). When I compare what Major Elmslie and those who went out with him went through, with what we went through in 1885, I think they were in some ways singularly fortunate, for we had no railway to convey us over that stretch of desert and we had not steamers to take us up those upper reaches, but the men had to toil in rags, some without boots to their feet, blistered with the sun, scarred by the hard toil; and their cheerfulness, their splendid courage under all those difficulties—well, none of us who were with them can ever forget it. Under such great difficulties as there were for those who were with Major Hunter-Blair and Major Young in those marches of which they have told us, when great distances were covered in that burning desert in so short a time—I have no doubt that those men showed the same constancy and the same fortitude that our comrades did in that campaign in 1885. That, thank God! is the characteristic of the British soldier wherever he goes. Then I think that these Egyptian campaigns have also to many of us been a great delight because they have brought together the soldiers and the sailors, (loud applause) and the experience of all of us who have served in such mixed expeditions is that wherever we have to work together we are the best of friends, the truest comrades, and that when the campaign is over the Sailor has a respect for the Soldier and the Soldier has a respect and love for the Sailor.

I do not think that this is the time to enter into the technical Artillery questions in connection with this campaign, and I should be very glad indeed if I could have an opportunity of coming here again on another occasion to hear these questions thoroughly well discussed, for there is a great deal that I want to know; but there is one feature in connection with them on which Major Elmslie touched and which is to me, and I think to all of you here, of infinite interest, and that is that this was the first occasion on which high explosive shells have ever been used by troops in the field, and that our high explosive shells were so great a success as they were. That there was not one premature explosion, that the accuracy in the shooting was so good and the destruction done so great as it was, must be to all of us a matter of great satisfaction, because the day is close at hand when these high explosive shells will be introduced largely into our service, not so much for field guns as for fortress guns; and it is a great satisfaction to me to be able to say that with the large number of Lyddite shells that we have now fired (and we have put them to the most tremendous tests, we have fired them with pressures in the guns that the shells were not constructed to resist, and the shells have actually set up under those pressures), there has not been a single premature explosion. That is a matter of great satisfaction to me, as it is that the fuzes used for these shells have proved perfectly safe and that Major Elmslie had not an accident of any sort although this was the first time those shells were ever used in the field. The only other thing I have to say to you is of a personal nature. Major Elmslie had received a most excellent, a most pleasant and most interesting appointment; but, there was a chance of his battery going on service, and he resigned that appointment that he might take that chance. That is the true spirit of the soldier, and that is the spirit which I trust and believe that every officer in the Royal Regiment of Artillery possesses; and there is not one of us who does not say that Major Elmslie was right and who does not feel what a true soldier he was to take that course (loud applause). I ask you now to join me in giving a most hearty vote of thanks to Major Elmslie for his charming, interesting and instructive lecture (loud and continued applause).

Major **Elmslie**: Thank you.



THE CROWN OF THE CAMPAIGN.

THE BRITISH FLAG HOISTED ON GORDON'S HOUSE, KHARTOUM, SEPTEMBER, 4TH, 1898.
EGYPTIAN GUN-BOAT LYING ALONGSIDE.
From a photograph by Major F. B. Elmslie, R.A.

ARTILLERY USED IN RECENT CAMPAIGNS IN EGYPT AND ITS EFFECTS.

A Discussion held at the Royal Artillery Institution, Woolwich, on Tuesday, 29th Nov., 1898.

Lieut.-General Sir H. Brackenbury, K.C.B., K.C.S.I.,
Colonel-Commandant, Royal Artillery,
President of the Ordnance Committee, in the Chair.

The Chairman :—General Maurice, and gentlemen, I am very glad to see so many officers present here to-day and I hope we shall have a really interesting discussion. There were five different classes of equipment in action in the recent campaign in Egypt: the 5-inch Howitzer under Lieut.-Colonel Elmslie, whom I congratulate on being Lieut.-Colonel (applause) : the 32nd Field Battery with our own 15-pr.; the Egyptian Horse Artillery Battery under Major Young; the Maxim-Nordenfeldt guns, and the Maxims. I think the best way to conduct this discussion will be to deal with each of those classes of equipment separately. As the matter originated with Colonel Elmslie's lecture I would propose to begin by asking him to tell us anything he can that will be of interest to us as Artillery officers as regards the performance of his Howitzers; then anyone who wishes to ask any questions or to make any remarks on what Lieut.-Colonel Elmslie has said should do so. I will then say anything I have to say, and then we will pass on to the next equipment and so on. Then finally, if necessary, we can have a general discussion on general points, including the tactical points, if anyone would like to say anything upon them.

I think there must be some present here to-day who are not familiar with the 5-inch Howitzer equipment, and I will ask Lieut.-Colonel Elmslie if he will just state generally the chief points of that equipment,—I shall be glad even to refresh my own memory about them,—telling us for instance what was the weight behind the team, how they were drawn, how they behaved on the march, how they behaved in action, how the guns were laid, what rate of fire he had from them, what the fuzes were, and generally any points of interest that can be brought to our knowledge in connection with the Howitzer battery. Lieut.-Colonel Elmslie, will you kindly open the discussion (applause).

Lieut.-Colonel Elmslie :—Sir Henry Brackenbury and gentlemen, the questions that have been put with reference to the Howitzer battery are very clear, and the best thing I can do is to describe it as shortly as possible.

As regards the Howitzer batteries at present in the service there are three of them organized as Field Batteries; that is to say, the guns are horsed with six horses each; they have six guns each; and the *personnel* is in every respect the same as that of a Field Battery. As to the weight behind the team that we had in Egypt it was 45-cwt; that included two rounds of case shot in addition to what the limber itself carries; there were two rounds of case shot over and above the proper equipment of the gun, and those were strapped on the top of the limber. In England they are drawn in the ordinary way by teams of horses; in Egypt they were drawn by teams of mules. I may say that was entirely a scratch arrangement. When we got out there we had a very short time in Cairo; we received our mules and a great deal of harness and had to do the best we could. The harness did not suit the mules,—the traces were too long; I think they were horse traces.

The Chairman :—Six mules per gun?

Lieut-Colonel Elmslie :—Eight mules per gun, Sir. I do not think it is fair to say too much about the harness because it was more or less improvised, but it could be greatly improved no doubt. One feature of the harness was that every mule carried a pack-saddle,—that was a very important point indeed. The pack-saddle in conjunction with the ammunition arrangements enabled you, when the gun was in position to unhook your mule and to send him to the ammunition depôt, and he came up carrying on his back shells or cartridges as the case might be.

Perhaps it might be convenient to mention here exactly what the arrangements were. They were most carefully thought out by the authorities at home; I only regret that we did not have more opportunity of testing them to the full, but so far as the test went they were most satisfactory,—I could not wish for anything better. The 5-inch Howitzer fires a 50-lb. shell, which is too large to handle with comfort in the bare hands, and requires something to carry it by, either the little strap that is used at drill or some other arrangement. We were supplied with little canvas buckets which just fitted the shell and had a rope handle at the top. There was no difficulty in getting the shell into one of these buckets which was then lifted up and hooked upon the pack-saddle. The people at the ammunition depôt fitted the shells in the buckets which were then stood on the ground, and when a mule came up he stood between two rows of shells, a couple of men hooked them on his back, and he was away in a moment. Each mule could carry four shells or two boxes of cartridges. In order to see what distance we could go from our base, we worked out very carefully the time that it took to do all these things. I am sorry that I have not the figures with me but they could be worked out again if necessary. We made out that when using pack mule supply we could easily keep up a good rate of battery fire up to a distance of at least two miles from the base where the ammunition was. Considering that all this was worked out at home by the authorities at the War Office, I think it was a most satisfactory thing to find when we got into the Field. Before leaving the question of ammunition supply I should say that the cartridges and fuzes had special boxes provided for them, each box carrying forty rounds complete,—that is to say forty cartridges and forty fuzes. A couple of those boxes would go one on each side of the pack-saddle, and were fitted with rings so that there was no difficulty in hooking the boxes on each side of the mule and he went up to the battery with eighty rounds. Unfortunately in one way, we did not actually use all these when we were at Omdurman because we were so close to our supply that we had left the mules on the other bank, and it was all done by hand, but the boxes were used and the little shell carriers that I mentioned, and everything was most satisfactory.

The next point that Sir Henry Brackenbury mentioned was the method of laying. In a Howitzer battery you have to be very careful indeed with your laying; it is not a thing that you can afford to be "sketchy" about. The shells are very heavy and consequently very valuable; they cost a great deal of money to buy, they are a great expense to transport and they should not be thrown away. Another thing is that being of course a curved trajectory as compared with a gun, unless you range exactly, you waste your ammunition, because you do not get the same latitude as is allowed with the flat trajectory of a gun. I determined to use nothing but clinometer elevation which has nothing to do with any personal error or excitement of the layer; so long as the layer sets the instrument correctly, and gets the bubble in the centre of the glass the gun must be laid correctly for elevation. We used the clinometer during all the operations at Omdurman with the best results, and I was exceedingly pleased with it.

The rate of fire is the next point. We have never found any difficulty in battery fire with six guns of keeping up a rate of twenty seconds. We went several times during the firing at Omdurman to battery fire, but unfortunately we were always obliged to return to sub-division fire on account of the enormous clouds of smoke and dust that were made by the shells in bursting; so that after a few rounds the target was entirely obscured and it was no good going on with battery fire, so we returned again to sub-division fire. But the rate of battery fire that a Howitzer battery can comfortably work at is not more than twenty seconds and I think it could be worked at less if required.

The Chairman:—One moment if you please. I understand when you say that the rate of battery fire was twenty seconds you mean that your battery fired a round in twenty seconds.

Lieut.-Colonel Elmslie:—Yes Sir.

The Chairman:—That is to say your battery fired three rounds in a minute.

Lieut.-Colonel Elmslie:—Yes Sir, and I also think it could work faster. I think it can be done at fifteen seconds; but twenty seconds gives plenty of time to everybody.

The weight of the shell is 50 lbs; it is a large shell and a very effective one. The bursting charge is Lyddite and the pattern that we had, Colonel Bainbridge tells me had 4 lbs. 14 ozs. or practically 5 lbs. of Lyddite in it. The new pattern shell which he will tell you all about has got something like double that bursting charge and should be proportionately much more effective.

Of the fuzes we had two natures: we had the ordinary direct action fuze and we received at the last moment some new fuzes which were practically direct action fuzes fitted with the safety arrangement which is of course very important indeed. I fired the greater part of those fuzes,—something like 350 of them,—and on the whole with excellent results. Speaking of fuzes of course the direct action fuze, as we all know, is intended to go off on striking the object on actual impact. If you put in a large shell with a large shoulder and the shell grazes the ground it very often happens that the fuze never touches the ground at all; the shell glides off its shoulder and rises, and that causes a blind. As a matter of fact we suffered from blinds at Omdurman, and I have little doubt the greater number of those blinds were due to the shell grazing on the shoulder and not striking on its point—the fuze was not struck and therefore was blind. I think it is of the greatest importance that a howitzer battery should be fitted with a fuze which will act on the graze if it can be done safely, which of course is a matter of the greatest importance. I felt up the Nile that there was only one real anxiety,only one thing to be afraid of, and that was what would happen in the case of our being attacked by an advancing enemy, what should we do, knowing as I did, that the fuzes would probably be blind? It is no good firing solid shot at them or not much good. That was one of the things which, fortunately perhaps, was never settled, but I felt very much the want of a graze fuze and desired to have one; and I am sure it is an important thing to work for.

The charges of the howitzer (in case anyone here has not seen them) are very nicely arranged things. Of course one of the points of the howitzer equipment is to be able to vary the charge so as, if necessary, to be able to drop shell into the work or at the object with a greater or less angle of descent as may be required. The cartridge is therefore so arranged that it can be varied with the greatest ease. Our cartridge consists of a small thing shaped like a mushroom with head and stalk, and on that stalk are threaded three separate rings of cordite. The whole affair is the full charge of the gun. If I wish to reduce it, one, or two, or all three rings are removed from the charge, and the remainder is sent up to the gun. We have had that for some years past now and I have always found it satisfactory; I cannot recall a case in practice of a wrong charge being sent up to the gun, although at different times we have fired every class and nature of charge; the gunners all understand it, it is no trouble, and I do not think it can be improved upon. But speaking for myself I do not like the reduced charges because I think the gun does itself best justice with the full charge,—it is the charge that suits it, and therefore I think that, unless the object were such as to specially call for it, I should not use a reduced charge at all. And in Egypt I never did; we fired nothing but full charges the whole time.

The ranges varied very much indeed. When we first came into action we found that the tomb of the Mahdi, which was the first object we fired at was most conspicuous; our range-takers took it and gave me good ranges all through. Using the mekometer they could always give the range in a minute, and very correctly, and no doubt it saved many rounds, because in Omdurman there were crowds of buildings and walls, and there was no possibility of estimating the range as there is in open country; among a lot of buildings and walls with prominent objects here and there, there was nothing to take as a guide, and one might very well have estimated the range very wrongly. We were fortunate enough to get the range very quickly every time. The longest range was 3,200 yards. That was an elevation of something over eighteen degrees and at that range we had to my mind very satisfactory shooting. We got a large number of hits, more than I hoped for; as I said, the guns did exceedingly well. The shortest range was 1,250 yards,—that was directly across the river to a fort that lay on the opposite side exactly in front of us, and which was an angle of elevation of a little over six degrees. There were intermediate ranges of all kinds between those two but the greater number of rounds were at ranges of not much more than 2,200 yards,—that and below.

The CHAIRMAN:—May I ask you a question on that particular point? You say that when you were firing at these short ranges of 1,250 yards, you preferred a full charge and a low elevation to using a reduced charge and a higher elevation.

Lieut.-Colonel ELMSLIE:—Yes Sir.

The CHAIRMAN:—That low elevation and low angle of descent were probably the cause of your fuzes not acting.

Lieut.-Colonel ELMSLIE:—Yes Sir.

The CHAIRMAN:—Would you still if you went into action prefer a full charge and a low angle to a reduced charge and a high angle with that fact in your mind? It would be very interesting for us to know.

Lieut.-Colonel ELMSLIE:—I am very much averse, Sir, to changing charges in action; I think it is unsound. If I had had, say six blinds in succession I should then have changed the charge no doubt; but as they came at irregular intervals during the firing I did not know until the end of the day—how many there had been. One was not of course carrying out experimental practice as we did at Shoeburyness under experimental conditions, and it was not until the end of the day that one got to know how many blinds there had been. Round after round was fired and there were bursts in various directions, and then a blind and so on. I am averse to changing charges because it requires ranging again,—you have to range afresh.

The detonation is the next point, and about that it is very difficult to give an opinion. The explosions that I saw and heard were tremendous,—tremendous explosions took place; but I saw also on every occasion enormous clouds of smoke mingled with dust which was so thick that on the 2nd of September, it completely prevented our firing except at very slow rates. There was a light air which blew towards us, and again and again we could not see the objective for a considerable time owing to these clouds of smoke and dust; and I do not think that points to what we call detonation having taken place. At the same time the effects were exceedingly good, and so I think it does not much matter what you call it. I saw very large flashes occasionally but what they meant I do not know. I never saw anything set on fire. With all those shells that fell into that place some of them must have hit something inflammable, but I watched carefully to see if anything was going to begin burning and I saw nothing—I do not think any fire was lighted by all that bombardment and that also made me think that a few incendiary shells would be a valuable piece of additional equipment,—something that you could be sure would set the place on fire if you wanted to do so; because it is conceivable that you might be asked to set a village on fire and it would not be at all satisfactory if you could not do it.

The CHAIRMAN :—If you will forgive me for interrupting you once more, on the subject of detonation, could you observe the colour of the smoke?

Lieut.-Colonel ELMSLIE :—Yes Sir, it appeared to me to be yellow or grey. I saw no black smoke that I remember; there may have been a little now and then; but there were great clouds of smoke and dust there, and I did not see any black at any rate.

The accuracy was excellent so far as I was able to judge. We got the ranges very quickly, and when the ranges were got we got a very large number of hits. I felt personally quite satisfied with the guns; I thought they were shooting well. A great deal of course depends, with howitzers, upon the ground on which the guns are standing and I was fortunate enough to have officers who understood what they were doing, so that when the ground got a little cut up, they shifted the gun to a better piece and by watching it and working it as we always do with the greatest care, the accuracy was very great. I have no idea how many hits we actually got at different objects but we got a very large number. When we fired at the walls, we got hit after hit.

As to the effects of the fire, I am only able to say what I saw from the guns during the firing. I had not an opportunity, unfortunately, of getting into the town, which I am sorry for, and always shall be, but it cannot be helped. To take first of all a prominent object, the dome of the tomb, we very quickly got on to that; at the third shot I think we got a hit and after that we got a great many hits. Some of the first shells knocked holes in it; at one time I saw a dozen holes I suppose in the dome; and then there came one shell which blew out the whole area contained between the figure formed by these holes and thus made a large rent which you could have driven a wagon through. That was not the effect I think of a single shell but was the result of several shells which made the holes first of all and then this one came and blew out the middle. At any rate that object had no resisting power against those shells. The walls of the citadel were very much larger and thicker; they were reported as having been from fifteen to twenty feet high and about six feet in thickness, and in those walls I saw shells blow large holes, very large holes!

The CHAIRMAN:—Right through the walls?

Lieut.-Colonel ELMSLIE:—Yes Sir, I saw holes made in the walls by single shells, and large holes. I do not mean just where the shell passed through, but holes big enough for a man to walk through, after a certain number of hits whole sections of wall fell.

The CHAIRMAN:—What were the walls made of?

Lieut.-Colonel ELMSLIE:—I think, Sir, if you ask Captain Buckle who actually examined them, he can tell you better than I can. They were of large stones fastened together with mud and so on. After a certain number of hits large pieces of wall fell down and we were able to see right into the place. It was through one of those breaches which we made, that the gun-boats were able to fire right up the main street. I did not myself, of course, see any effects on people except in one instance. I certainly saw one man who was bolting from a barrack; we were firing at a barrack, or what I took to be a barrack, and inside that barrack must have been the most awful place in this world with the shells bursting there. I saw beams and all sorts of things flying in the air and these fearful explosions were going on. We were firing battery fire at the rate of at least three shots a minute. The great gate of the barrack was facing us on the river bank, and I saw this gate open a bit and men began to bolt in one's, two's, and three's; they ran along the front and got round the corner, but when one man was bolting a shell happened to burst close to him and he disappeared altogether; there was no body, that I could see and people who entered the town told me that a good many men who were probably close to the explosions, were actually blown in pieces. Unfortunately we did not get the chance of testing the shells at a body of men; I should like to have seen that just to know what they could do, but there was no opportunity.

I do not know, Sir, that there is anything else I can say.

The CHAIRMAN:—We are very much obliged to you (applause).

Now, perhaps Captain Buckle who was in Colonel Elmslie's battery at Omdurman would tell us something of what he observed of the effects of these shells.

Captain A. S. BUCKLE:—Sir Henry Brackenbury and gentlemen, I am afraid I have not very much to add to what Colonel Elmslie has said; the examination that we made was rather hasty but still I can, perhaps, give a few details of the buildings that were shot at.

The Mahdi's tomb was really rather a strong structure; the lower portion was square, made of brick, about four feet thick, and the dome was I should say, two and a half feet thick. The large hole I estimated was about twenty feet high and twelve feet wide; of course that was made by several shells. The top of the tomb was also blown off for a distance (downwards) of about six feet, making a large hole in the apex; that was done by two shells.

Then as regards the question of setting fire to buildings; I found two bursts of shell which had fallen short of the Mahdi's tomb when we were shooting at it. One burst in lath and plaster and another in thatch; the thatch was yellow with the bursting shell but it was not burnt at all.

The CHAIRMAN:—Were there no signs of fire?

Captain BUCKLE:—There were no signs of fire that I could see Sir; it was merely destroyed close to the burst. The wall, as Colonel Elmslie has said, was about six feet thick at the bottom and four and a half feet thick at the top and from twelve to twenty feet high. It was made of large rubble and stones which were fastened together, rather weakly I think, with some sort of mud, and was finished off very nicely outside and looked strong; but was not nearly so strong as the wall they put up for us to practice at, at Abbassiyeh. As to the holes that were spoken of by Colonel Elmslie, there were two of them near one place we had been shooting at in the wall, each of them large enough to ride through, but it was merely a hole; the top of the wall was still standing above it. We made three breaches altogether in the wall, but we did not go on with two of them; one we found was no good; it only led into an enclosure; and at another one we could not see the effect of our shells well, so we abandoned it and went on to make a large one where there would have been quite room enough for a dozen men to go in abreast; it was rather a steep approach up the debris, but still it was a very practicable breach. Then we fired at the Beit-el-Mal and barracks, but the only effect to be noticed was, that the shells passed through the walls, which were about a foot thick, and burst on the other side; they did not burst on the wall but passed through and burst inside. So far as we could see, the man-killing effect had been very good. We fired at what we thought was a gunpowder factory but which turned out to be a workshop; but not many rounds were fired at that. Only the front wall was breached and there was not much damage done inside because we did not go on firing at this building. We hit the parapets of the forts which were made of clay or hardened earth—I should say about eight feet thick at the top—and made large craters; but the best effect as one would expect was obtained by the shell bursting inside the fort; naturally the shell bursting in all directions practically silenced the fort at once. Unfortunately we did not get to see the town until two days afterwards when the dead had all been cleared away. I only saw one small heap of about half-a-dozen, who were evidently killed by our shells; but there were no others left in any place that we shot at. Still you could see that there had been a great deal of effect because there was a lot of dried blood about, and a lot of pieces of men which, they had neglected to clean up. That is the only way in which we could judge of the effect—from that and the reports of others who had been in the town before the dead had been removed.

The CHAIRMAN :—You say you saw six dead men in a heap ?

Captain BUCKLE :—I think, Sir, they had been put in a heap.

The CHAIRMAN :—I suppose it would not have been very possible two days afterwards, in that climate, to examine the bodies.

Captain BUCKLE :—No Sir!

The CHAIRMAN:—You could not tell whether they were killed by blast or fragments ?

Captain BUCKLE :—By fragments I think, Sir ; they were very much cut about. We were told afterwards by people who had been in there soon after that the man-killing effects were very good ; and I am told the moral effect also was very great ; at any rate we can tell by the impression that was made on the Friendlies, they thought a great deal of it.

I do not think, Sir, I can add anything more to the discussion.

The CHAIRMAN :—Thank you (applause). Will anybody else make any remarks or ask any question ; or will anybody give us any hints or suggestions ?

Colonel F. G. SLADE, C.B. :—I should like to ask, did Colonel Elmslie fire any other projectile from the howitzers but the one described ?

The CHAIRMAN :—You had nothing else, Colonel Elmslie, had you ?

Lieut.-Colonel ELMSLIE :—We had case shot and star shells, but there was no occasion to fire either.

Colonel C. TRENCH :—It would be interesting, Sir, to know if there were any blinds when firing at a vertical target. The target was, I presume, often a wall or more or less upright mass, and if the blinds came off in firing at a vertical target, it would be more serious than if they were on graze.

Lieut.-Colonel ELMSLIE :—I do not think I quite understand the question.

Colonel TRENCH :—Had you any blinds when the shell struck a vertical target ?

Lieut.-Colonel ELMSLIE :—No, I never saw one blind when the shell actually struck directly on impact.

Lieut.-Colonel T. PERROTT:—I should like to ask Colonel Elmslie what observation he made use of ; whether it was his own observation or whether he had any observers out.

Lieut.-Colonel ELMSLIE :—I simply used my own observation exactly as I should have done with any other gun.

Colonel E. BAINBRIDGE, C.B. :—In the first place, Sir, I should like to say a few words about the fuze. The fuze was of the direct action type, which you all know, but modified so that, supposing there was a premature discharge in the gun, the flash from the detonator would not reach the magazine and fire the shell. It is laid down in the hand-book that the direct action fuze is not supposed to act as a certainty when fired at an angle of elevation of under ten degrees. From what Colonel Elmslie has told us a great many of these rounds were fired at ranges under 2,000 yards. The elevation at 2,000 yards is ten degrees ; accordingly they were fired under ten degrees and some of them six degrees. Therefore I am surprised that there was not a larger percentage of blinds than there were. I think the number of blinds that occurred were 30 out of 360 rounds. Of course the advantage of this fuze is that for the first time in action, men have been able to stand up to their guns firing high explosive shells. This fuze has been tested by the Ordnance Committee and others as to safety by actually producing prematures in the guns; and it did not reach the magazines and did not fire the shells. Therefore when they only got 30 blinds out of 360 shells and those fired at an angle of six degrees, I think they really did very well. The shell used had only a bursting charge of 4lb. 14 oz. The present Mark II. shell has a bursting charge of 9lb. 15oz., that is to say more than double; and therefore I suppose it would have a still greater effect. I am sorry that the case shot and star shell were not tried; they were both perfectly new and were sent out there for the first time.

There is one question I should like to ask. You have all tried the T friction tubes and you have not, I am afraid, been very satisfied with them owing to the pull off. Those that you have used, have been the Mark I. and Mark II., but I think Colonel Elmslie's battery was supplied with the new Mark III. tube which I hope has given satisfactory results; and when it comes to the batteries I hope it will be favourably thought of. I should be very glad if Colonel Elmslie would tell us something about this.

Lieut.-Colonel ELMSLIE:—With regard to the tubes Sir, they were the Mark III. tube as Colonel Bainbridge has mentioned and they were most satisfactory; we had not a single misfire and we had no trouble at all.

I should just like to make a slight explanation with reference to what Colonel Bainbridge said, and what you Sir, asked me. We were not firing at a horizontal plane but at walls and buildings, and that is the reason why (perhaps I should have said it when you asked the question) I did not alter the charge or the elevation; the target was quite a suitable one for the full charge. If I had been firing to burst the shells on a horizontal plane it would have been a different thing altogether, but we were firing at walls and buildings and not testing fuzes.

Colonel BAINBRIDGE, C.B.:—If I may trouble you once more Sir, I forgot to say one thing, which is this:—Colonel Elmslie has said that it is desirable that we should have a graze fuze for the howitzer. Not long ago I was asked to produce a design for this and I am happy to say that I have satisfactorily fired them at Shoeburyness, they had the same safety as the others but they will act when fired at two degrees elevation. I fired them with the full and the lowest charge in our howitzers and they all acted at two degrees.

Major-General F. T. LLOYD, C.B.:—I should like to ask Colonel Bainbridge, with regard to the increased bursting charge that he proposes to put into the 5-in. howitzer, whether it will not occupy so much space, that very little of the interior walls of the shells will be left and therefore there will not be so much damage done. If you double the bursting charge the shell must be so much thinner.

Colonel Bainbridge, c.b. :—That is quite true, Sir, but the effect of this shell was considerable. I do not know that I am divulging any secrets, but it was decided by those, who have to decide, that the effect of this shell was much greater; it has a length of 3·65 calibres as against 3·2 calibres.

Captain May, R.N. :—Perhaps, Sir, I can answer this question. If you take the old shell it is thicker throughout head, base, and walls. The head generally does not do much harm, or the base either; the walls are the effective part. The new shell has a greater proportion of its weight in the walls and a thinner head and base besides the extra weight of the explosive. I examined a great many of the craters and there is no doubt that the effect is much greater.

Major E. S. May :—I cannot help thinking Sir, that the real influence after all of these howitzers is mixed up with the question whether the howitzer is a field-gun or not.

The Chairman :—I think that if we enter upon that discussion we shall be wandering just a little bit wide of the question.

Major May :—I did not propose to enter into the whole subject, but there are several points which, I think, it would be interesting to have some more information about.

The Chairman :—Certainly.

Major May :—I will not take up much time. In the first place when Colonel Elmslie described the weight behind the teams as being only 45 cwt., it certainly surprised me, because I saw some howitzer batteries last autumn at Okehampton, and I understood then that the weight behind the teams was nearly 50 cwts., but it was at any rate such a weight as appeared incompatible with mobility for the field. If they can bring it down to 45 cwts. behind the team I think it would be a great improvement and a great advance.

Then it seems to me that a great difficulty with howitzers is as to how you are to meet an infantry attack. Did Colonel Elmslie glean any experience which will throw light on this question, and on the man-killing capacity in the open of the howitzer? If you take a howitzer into the field you may have to meet such an attack and to engage troops in loose formation, not in compact masses, or in works. In this connection I should like to ask whether anybody here can give us any information as to what the area of the space is over which the burst of one of these shell operates. What I mean is how many yards is the diameter in which one of these shell operates when it bursts and what is the average size of the fragments into which it breaks, looking at it from the point of view of a man-killing projectile; in other words whether its effect would be very local or not.

The Chairman :—I will ask Captain May of the Royal Navy to answer those questions, because I think he has seen as much of the firing of howitzer shells as any of us.

Captain May, R.N. :—As regards pieces, I think I may say that the head of a shell commonly tears into four or five segments, something like the fingers of ones hand; sometimes there may be as many as six or seven and sometimes as few as three or four; but four or five would be about the average. They are fairly big and if the shell is going horizontally with any velocity, they go on pretty hard in the original direction. The walls go into very small pieces. Sometimes you get a long piece from the wall, perhaps an inch and a half broad and two or three inches long, but more commonly those long pieces break up into little pieces about the breadth of a finger and a length of half that. Close to the base the pieces are very small indeed, little rags no bigger than the thumb nail. The base itself generally goes into four or five pieces, but if the shell is going at any speed they are checked by the action of the explosive and do not, as a rule, hit things violently. If the shell is stopped before it bursts, as on a wall, they have the same velocity and violence as the other pieces, and perhaps a trifle more.

The CHAIRMAN :—Does that answer your points Major May?

Major MAY :—Not quite, Sir.

The CHAIRMAN :—Except with reference to the weight.

Major MAY :—My point is whether the small pieces will kill a man, and at what distance.

Captain MAY, R.N. :—Yes Sir, I am sure they will; even the little pieces like your thumb nail will cause a deep wound. Of course they spread in all directions; they would not be only at all points of the compass but at all points of the celestial concave, thus at even a small distance from the point of burst the pieces are somewhat scattered.

Lieut.-Colonel ELMSLIE :—With regard to the area of explosion, I may say that at Cairo when we were firing at a wall there the range party were ordered to keep 1000 yards away which they did; but after a few rounds I saw that range party bolting like hares. And I remember something similar at Lydd last year; perhaps Captain Currie can tell us the distance the range party were off, but I remember I saw them running.

The CHAIRMAN :—Is there any other officer who would like to ask any questions?

Lieut. H. R. W. M. SMITH :—With reference to what fell from Captain Buckle, Sir, I should like to say that I went into Omdurman, and there is one point on which I should like to take issue with him, that is with regard to his statement that the people were killed by fragments of shell. I examined several bodies and I came to the conclusion that they were killed not by fragments but by the direct force of the explosion. There was one heap I saw where ten men had been killed by the explosion of a shell whose crater was visible at about ten yards distance. I saw no other trace of any shell near, and those ten men were all distinctly blown in pieces; their limbs were blown off and they were otherwise mutilated, but I could see nowhere any wound such as [that which, I imagine, would be inflicted by the piece of a shell.

There was one episode, Sir, that brought home to me very strongly the power of these shells. Nearly opposite us on the river there was a small fort containing four guns. While the gun-boats were running up close to this fort there were two shells fired at us, which sang not far over our heads, and one of which was subsequently picked up. We turned our fire from the tomb on to the fort and put one or two shell into it. It is not easy, I take it, to drive a gunner of any nation from his gun, and the Dervish is not inferior in courage to any race on earth. That fort never fired another shot. I went into it afterwards and there were traces of only about two men having been killed there and one of our blind shell was lying in the middle of it. Therefore, the Dervish gunners were driven from their guns by the moral effect of one or two shell.

The effect of the noise of continuous firing upon the numbers of the gun was very marked. One of my Nos. 2 was completely deafened by it and several times fired late during the salvos and we failed to get a good salvo owing to his not being able to hear the word of command. I think if the signal of the No. 1 to fire the gun were re-instated it might do away with that objection. The Germans, I believe, tell their men to put their fingers into their ears.

As regards the direction of the fire in firing at the Mahdi's tomb, it was a long range and it was very difficult to get shots on the target; they went right and left and the trails dug deep holes in the ground and often swerved off to right or left, and sometimes the trail would have been just poised on the edge of a hole so that it was necessary to change the position of the gun in order to obviate the difficulty. I believe a suggestion was made some time ago to broaden out the trail to obviate that. In the very heavy muddy ground the disadvantages of the want of some such arrangement were very noticeable.

The Chairman:—Now gentlemen as nobody else seems to wish to say anything about the howitzers, I will end the discussion about them by saying a few words myself. I think it must have been very interesting to us all; I know it has been to me, and I have learnt a good deal.

First of all I would say about these 5-inch howitzers, as regards their *rôle*, that we had an experiment at Okehampton last year or the year before, when we had comparative fire between a field battery with shrapnel and the 5-in. howitzer with shrapnel firing at different kinds of targets, stationary targets and moving targets. The Ordnance Committee were present, and the result of that trial was that from our point of view it was established that, weight for weight of shrapnel carried, the 15-pr. field battery would do more with shrapnel than the 5-in. howitzer battery. There was also a trial for mobility, and it was perfectly clear that the howitzer battery, which does not mount its gunners and cannot go out of a walk, is not so mobile as the 15-pr. field battery. And the Ordnance Committee expressed the opinion that the *rôle* of the howitzer battery was to search out with high explosive shells men behind cover which could not be searched by shrapnel.—To that conclusion we were led by those experiments, and I am inclined to think, after what we have heard from Colonel Elmslie to-day, that he confirms that conclusion. The howitzers seem to have done their work most thoroughly in breaching also, and breaching is a thing which I confess we did not contemplate as being part of their duty. The guns and the equipment too seem to have behaved extremely well.

As regards the ammunition, the larger shell which has been spoken of has been approved for use with those howitzers after very considerable trials, in which it has distinctly proved itself as accurate as and more destructive in effect than the service shell.

As regards the fuzes, these Lyddite shells, as you know, are a new experiment; I mean they have never been tried in the field before; up to just before Colonel Elmslie's battery started for Egypt no Lyddite projectiles had been fired in this country, except under precautions. The question of what precautions were necessary was one that was referred to the Ordnance Committee. Bearing in mind that we were most anxious that Lyddite should be introduced into the service, because of what we have learned from many experiments to be its very destructive effect, we were most anxious that there should be no accident early in the stage of the history of Lyddite, which might have condemned it in the eyes of the Royal Artillery, and made the men afraid to use it. Consequently we stuck to these precautions and insisted on these precautions being carried out. And then there came the question of a new fuze. Now we had one fuze which we did not think altogether safe, because it contained fulminate. There was another fuze which was absolutely safe, but which would not act with reduced charges. Consequently we tried to get a fuze which would act with reduced charges and which at the same time would be perfectly safe. We attached, I must say, the most enormous importance to this question of safety, because as I need not tell you, the explosion of a Lyddite shell in a gun is a very different thing from the explosion of a powder shell in a gun; if the powder shell bursts in a gun, if the gun is properly made, all that it does, is perhaps, to damage the bore, but if the Lyddite shell bursts in a gun in all probability the gun will go too, and there will be a very serious accident. Therefore we have insisted on safety in our fuzes, and Colonel Bainbridge designed this fuze which was used by Colonel Elmslie, which is known as 9,000 M. I think it began at 9,000 and has gradually worked through various improvements till it has got to 9,000 M. That is the fuze that was used by Colonel Elmslie, and he has fired 360 rounds with it and there was not one premature. I think that is a very satisfactory result. That there were nine per cent. of blinds was not the fault of the fuze, I think I may say, because, as Colonel Bainbridge has pointed out, this shell was not intended to act on graze or unless the fuze itself struck the object. That Colonel Bainbridge will find us a fuze that will act on graze and also be safe, I have little doubt. He tells us that he has experimented with one at Shoeburyness and now it will have to go through the mill of the Ordnance Committee's experiments until they are satisfied with it. But I want you to understand that with this fuze the one thing we were aiming at was safety,—safety for the men who have to work the guns. We reported, I may say, before Colonel Elmslie's battery went out to Egypt that we considered that the 5-in. howitzer and the smaller nature of guns might be fired without precautions. I may go on to tell you that we have since had most exhaustive experiments with Lyddite shells from large natures of guns. We have fired them from 10-in. and 9-in. muzzle loading guns, with charges of quick burning powder that gave a great shock to projectiles, under pressures that the shells were not intended to stand, such pressures that the shells have set up under them, and yet in no single instance has there been a premature explosion, and we are now of opinion in the Ordnance Committee that these forged steel Lyddite shells which have been recognized with the fuzes which have also been recognized may safely be fired without precautions from the larger natures of guns (applause). I think that will interest you, although not directly concerned with the subject of our discussion today. Then as regards what Colonel Elmslie said about incendiary shells, that incendiary shells would be useful:—well, that must be a matter of opinion whether it would be worth while to substitute for some of these powerful explosive Lyddite shells, incendiary shells. For myself I should rather doubt it. We have not been altogether very successful with incendiary shells; they do not always set things alight. Captain May was telling me lately, that on board ship powder shells do not seem always to set things on fire, and I doubt whether it would be worth while to take away any Lyddite shells to put incendiary shells in their place. It seems to me that it does not matter much whether you set a building on fire or not so long as you make it absolutely untenable by men, and that your Lyddite shells undoubtedly do, though they do not set it on fire.

With regard to the radius of explosion about which a question was asked by Major May, I do not remember whether it was a 5-in. shell or a 6-in. shell; but there was an instance in which firing at 2,000 yards range at Lydd a piece of the shell came back among the gun detachment. I am told that it was an 8-in. howitzer. So the radius is pretty considerable. There is this peculiarity about these shells, that the angle of explosion of the shell is very much greater than that of powder shells. We do not consider the detonation is really satisfactory with these Lyddite shells unless the angle of explosion of the fragments of shell is at least 180 degrees. You never get anything approaching that of course with powder shells.

As regards the question of the noise of continuous firing which Lieut. Smith spoke of, I would suggest a very simple expedient which I often adopt myself when attending these experiments, and which they are not above adopting on board Her Majesty's ships, as you will learn if you stand on the bridge of one during practice, and that is a little cotton wool in the ears, which has a wonderful effect.

Lieut. SMITH:—The difficulty, Sir, was that the men could not hear the word of command to fire.

The CHAIRMAN:—That of course is common to all infantry as you know; in very rapid firing they cannot hear at all. There they get over it by the whistle; I do not know whether we could adopt anything of that kind.

Colonel J. R. J. JOCELYN:—Is it not the experience in the Navy, Sir, that cotton wool in the ears in no wise interferes with the men hearing the word of command, if not otherwise prevented?

The CHAIRMAN:—Yes, that is so. Has anyone else anything to ask or to say about the howitzer?

Now then about our own 15-pr. battery. Will Captain Nicholson give us some information as to how that acted in the Egyptian campaign?

Captain G. H. W. NICHOLSON:—Sir Henry Brackenbury and officers, I understand that you wish, particularly, to know about the behaviour of the 15-pr. battery on the line of march and in action, and again on the subject of the shell, the fuzes and the ranges.

On the march we had teams of mules, which was an entirely new equipment, and these mules for the march up there, were hooked in, in teams of eight. On the day of the battle we put in three extra ones making eleven in all; so, we had three mules in the lead, three in the lead centre, three in the wheel centre and two in the wheel. The drivers rode the near ones and drove the centre ones, the gunners riding the off ones.

I have not much to say of the march up there. The ground was flat and occasionally we came to small nullahs, but with the pick and shovel a road was soon made to get over them. We had more gunners with us than we were able to mount and these men came along on donkeys, or any other animals we could get hold of.

As regards the gun in action, the gun and fittings worked exceedingly well and we had no mishaps. The work in consequence was very much as one has it in the barrack square, but as regards the numbers at the guns, I have always been brought up to believe that the Nos. 7, 8, and 9 constitute the reserve and that they lie down in rear of the limber. As a matter of fact my experience at Omdurman was that these men were kept hard at it the whole time; there were no men lying down. At one time when we were firing pretty rapidly we had an extra man at the gun to assist the No. 3 in loading, standing alongside of him to give him the shell from the portable magazines. With regard to the ammunition, I think I may say that the shrapnel did all that was asked of it. It was, however, found necessary that we should take common shell up there in order, if necessary, to breach the wall at Omdurman. It was originally expected that we were to storm the town of Omdurman and application was made to home for these common shell for the battery, but home could not supply them and consequently we had them made under our supervision in the Egyptian Army work-shops, which were run by Major Staveley Gordon of the Royal Engineers. I may mention that these work-shops seemed always ready to meet any contingency (applause). As a matter of fact, I may tell you, Sir, we never fired a single round of common shell while we were up there. That was due to the Khalifa's tactics being different to the expected.

With regard to the fuzes, I should like to mention that a much simpler one could be made as regards the setting. For instance, in the Egyptian Army they have a German fuze, which, so far as I remember, requires merely turning to the necessary graduation and not clamping. The difference of time taken in setting would be very great I imagine. The air in the Sudan is very clear, and I was able to see nearly every round that was fired from my two guns in its path and in its final burst; of course that helped the subalterns a great deal with regard to deflection; you were able to judge the amount of deflection to put on with great nicety and you could follow your own shell.

As regards the ranges we fired at, our first range was at 2,700 yards; the second range was at 1,700 yards at a very fine artillery target, namely, a large mass of troops coming over a gentle slope of ground at 1,700 yards. Our next objective was at 900 yards, when we practically surprised a number of Dervishes, who we afterwards heard were the remains of the Dervishes that the 21st Lancers had made their memorable charge through. These I may say were completely mown down by our fire. After that our next range was at 2,000 yards, and from there, and our last position, when firing at the Dervishes in full flight, the range varied between 2,000 and 3,000 yards. Those were all our ranges.

I am afraid I cannot tell you very much of the effect of our shells; this I can merely mention from what I was told. And firstly, I should like to make one remark, which is, that on the day of the battle when we were in Omdurman, it was considered to have been a gunner's day, whereas in London now, day by day, it is turned into an infantry day. In consequence of this, I am perhaps somewhat shy in talking of the effect of the fire. As I said, on the battle-field we considered that we had done excellent practice, and that we had, as many people said, wiped out the Dervishes, and I can quote remarks from many infantry officers who were up there, who told me we had spoilt their show and not allowed them to have a look in at all. Still the papers are against one.

I do not think, Sir, there is anything more I can tell you in that way.

The CHAIRMAN :—Could you observe with your glasses yourself at all the effect of your fire ?

Captain NICHOLSON :—Certainly Sir, you could see the shells with the naked eye; you could see the Dervishes at 2,700 yards, and you could see the path of the shell from the moment practically when it left the gun until it burst in the air or on the ground as the case might be.

The CHAIRMAN :—Could you see the effect after it burst ?

Captain NICHOLSON :—What I tell you in that way is this, Sir. I must tell you that the Dervishes advanced through ground of flat sand with a certain number of bushes about it. The first we saw of these Dervishes was their banners and the battery was kept firing at these banners as they advanced. As shell after shell was fired these banners fell down and the next men picked them up again and on they advanced; it was the same thing over and over again.

The Chairman :—And when you got to the close range of 900 yards that you spoke of, you could see, I suppose, very clearly what the effect was?

Captain Nicholson :—The shell burst right in front and they were practically mown down.

The Chairman :—You could see the men go down?

Captain Nicholson :—Yes Sir.

The Chairman :—But not with the longer ranges.

Captain Nicholson :—No Sir, but I think that was principally on account of the bush. I saw the banners go down.

Colonel C. M. H. Downing : — How many rounds were fired at the 900 yards?

Captain Nicholson :—I do not think we fired more than 15 rounds, and we considered there were about 500 men there, between 500 and 600 men.

The Chairman :—I suppose it was rapid fire?

Captain Nicholson :—Throughout the day, Sir, we fired practically section fire after the start; we started with sub-division fire; the range was found at the third attempt and the fuze at the second, and immediately the remaining guns were fired off and section fire started at once. When we came into action at the short range of 900 yards we had just come over the crest of a hill, and the order was given for section fire at once.

Lieut.-Colonel Elmslie :—Without ranging?

Captain Nicholson :—Without ranging.

The Chairman :—That was at short range?

Captain Nicholson :—At short range, Sir. Have you anything more to ask, Sir?

The Chairman :—No thank you, I am very much obliged to you (applause). Will any one ask any questions?

Colonel F. G. Slade, c.b. :—Might I ask whether the fuze that Captain Nicholson spoke of was the fuze fired by the Maxim-Nordenfeldt 12½-pr.

Captain Nicholson :—The fuze I am talking of is the one of the so-called Maxim quick-firing guns.

Lieut.-Colonel H. B. Jeffreys : —Are any figures available as to the rate of fire obtainable at any time.

Captain Nicholson :—I cannot tell you that.

Major F. H. Crampton :—I should like to ask whether any difficulty was experienced in keeping the guns run up? We heard on the last occasion that there was great difficulty experienced by one battery.

Captain Nicholson :—With reference to that question, I may tell you that at our first position the ground was fairly hard sand covered with small stones. We fired on an average something over fifty rounds per gun and during that time my two guns were run up on three occasions only; and the reason they were run up then was not that they had recoiled far, but that the trail was digging a hole in the ground. With regard to the battery which Major Crampton mentioned, you heard that they had had to run up after every round, I saw that myself, Sir, with this gun in the Egyptian Army, it was a battery alongside of me. I do not think I am exaggerating when I say that after every round they had to run up five yards. That of course, as most people know, is on account of so short a gun and so large a shell.

The CHAIRMAN :—You had not to run up?

Captain NICHOLSON :—No Sir.

The CHAIRMAN :—You were on rocky ground you say.

Captain NICHOLSON :—I cannot call it rocky ground, Sir; it was sand covered with broken boulders and small stones.

The CHAIRMAN :—Did the wheels sink in much?

Captain NICHOLSON :—No Sir, not very much in the positions from which we fired.

The CHAIRMAN :—Then you mean practically that the gun did not recoil.

Captain NICHOLSON :—Hardly at all, Sir, not enough to have to run up,—that is what I wish to convey.

Major A HAMILTON-GORDON :—Was the ground rising in the rear, or was it comparatively level?

Captain NICHOLSON :—It was practically flat.

Major CRAMPTON :—Might I ask another question—whether the carriage on which the gun is mounted is the one known as Mark I., or Mark II., that is the one with the hydraulic buffer?

Captain NICHOLSON :—It has no hydraulic buffer, it has merely drag shoes.

The CHAIRMAN :—Would anyone else like to ask any questions or make any remarks about this?

Lieut.-Colonel ELMSLIE :—I do not know, Sir, whether it will be of any interest, but I may, perhaps, say that the howitzer battery had to employ the infantry escort to run up the guns. We found it tire our own men a good deal, and the infantry escort assisted.

The CHAIRMAN :—Were those Egyptian troops?

Lieut.-Colonel ELMSLIE :—No Sir, British infantry.

The CHAIRMAN :—There is only one point in connection with this part of the subject that I would say anything about,—well there are two things.

First of all I am a little surprised at hearing that there was so little recoil from the gun, because our experience with these guns is that they are rather apt to recoil, and in fact it is largely on that account, I think, that people are calling out so much and so rightly for Q.F. guns, and certainly we have found that recoil. It depends, of course, greatly on the ground; if the ground is soft it would check the recoil very much.

The other point that I would mention and say a word about is the fuze. It has been said that a simpler setting fuze is required, and that the Egyptians had with their Maxim-Nordenfeldt batteries the German fuze. Well, that subject I may say has been for some time past very much engaging the attention of the Ordnance Committee, who took it up some time ago, as to the necessity of having a quicker setting fuze, and I hope in course of time we shall obtain it. We have called for designs from our own factories of different methods of a simpler setting fuze, a more rapid setting fuze, and they have also been called for from people outside, and we are going to try, I believe almost immediately, these very German fuzes or these very German fuzes with a slight improvement. How they will answer in other respects, besides the mere one of quick setting remains to be seen, because after all, although quick setting is an important thing, we found in our experiments with quick-firing guns that you could always set the fuzes faster than you could fire the guns. So that quick setting is one of the adjuncts of quick-firing, but I do not think you need attach enormous importance to it, although of course it is a good thing to have a quick setting fuze if we can get it.

On the whole the report on the behaviour of our Field Artillery equipment seems to me very satisfactory (applause).

Now perhaps Major Young will kindly tell us about the Horse Artillery of the Egyptian Army.

Major N. E. Young:—First of all I should like Sir Henry Brackenbury to say that you are mistaken in thinking that I had a Maxim-Nordenfeldt. The gun I had was a 7·75 centimetre Krupp, and it is a gun that I hope will never be used again.

The Chairman:—I beg your pardon. I think the German fuze was used, was it not, with the Egyptian Field Battery; I mean the 12½-pounder.

Major Young:—Yes Sir. I do not think there is anything to say about my gun, except in the matter of the recoil.

The Chairman:—But I want you to tell us something more about your gun. You told us on the last occasion that it had a weight behind the team of only 20 cwt.

Major Young:—Yes Sir.

The Chairman:—Tell us something more about it. Our own Horse Artillery equipment is 30 cwt. How is the 10 cwt. taken off?

Major Young:—The limber was made of iron and there were only 27 rounds carried per gun. In the field altogether I think they had 50 rounds per gun on wheels.

The Chairman:—What is the weight of your projectile?

Major Young:—It is about 9 lbs, Sir.

The Chairman:—Shrapnel?

Major Young:—Shrapnel, ring shell and case shot; the shrapnel had the time fuze only, no percussion fuze.

The Chairman:—Do you know what fuze it was?

Major Young:—No Sir, I do not. It was simply a fuze for this gun and for no other I think.

The Chairman:—A Krupp gun?

Major Young:—Yes Sir, a Krupp gun and a Krupp fuze.

The Chairman :—Then what is the weight of the gun ?

Major Young :—I do not know, Sir. I daresay it is down here, but I cannot read it.

The Chairman :—You have got a book there ?

Major Young :—Yes Sir, but it is all in German (loud laughter).

The Chairman :—This equipment does not seem to have much to teach us.

Major Young :—It will not be used again. I may say it would not have been used then if we had got another kind.

The Chairman :—You do not consider then that it was a satisfactory equipment ?

Major Young :—No Sir, I do not at all.

The Chairman :—You do not think we have much to learn from it ?

Major Young :—Nothing at all, Sir ; I did not want to speak of it. (laughter).

The Chairman :—Except the one thing which you did say to us the other day, that was the importance of keeping down the weight.

Major Young :—Yes Sir.

The Chairman :—You liked it because it was only 20 cwt. behind the team ?

Major Young :—Yes Sir. Messrs. Maxim-Nordenfeldt were going to supply a new gun if they had time of the same weight throwing the same shell and using the same ammunition as the field batteries took out there, 12½ pound; but we did not get it, it was a question of money I think.

The Chairman :—There is one other point in connection with it. Was your shrapnel satisfactory, what you had ?

Major Young :—Very.

The Chairman :—And your fuze, was that satisfactory ?

Major Young :—The fuze was satisfactory so far as it went ; it was not percussion fuze which I should like to have had.

The Chairman :—How were your guns horsed ?

Major Young :—I had eight horses in the team.

The Chairman :—And only 20 cwt. behind the team ?

Major Young :—Yes, and a pole ; it was very lightly harnessed.

Lieut.-Colonel H. B. Jeffreys :—May I ask, Sir, anything about the quality of the Egyptians as gunners ?

The Chairman :—I think so certainly.

Major Young :—I cannot speak too highly of them. I have been in action a good many times with them now and I do not want to go with better men.

The Chairman :—Would anyone like to ask any question with reference to this Horse Artillery ?

Major May :—When Major Young was acting with cavalry did he have any escort with his waggons, and if not, did he find any difficulty when they were separated from the guns ?

Major Young :—I never allowed my waggons to be separated from the guns. As I mentioned on the last occasion, that seems a point which is not very clear in our drill book, namely, what is to be done with them, and I should like to know what people do think about it. We never drill with them at home.

The Chairman:—You never let your waggons be separated from the guns?

Major Young:—Never.

The Chairman:—You were asking, Major May, whether he had an escort.

Major May:—I wanted to know whether he left the waggons behind, and if so whether he had an escort for them.

The Chairman:—You spoke here the other day, Major Young, and you said "We also found the very great labour of running up; the men got extremely tired and found it very heavy work."

Major Young:—We did, Sir. On the top of that hill the ground was very rocky and hard and we had no brakes of any sort, and the men felt it very much.

The Chairman:—There was no arrangement to check the recoil at all?

Major Young:—None; that was part of the lightness.

The Chairman:—You had a very light gun and a very light carriage and were firing 9 lb. shell and you had no brakes and so you got a long recoil?

Major Young:—Yes, Sir, I found it jumped over the big stones there, and it was very hard labour to put it back and get it in line of fire again. On the other hand when we got into the plain to MacDonald's line at the end of the engagement, the gun made a little hole for itself and there was no recoil at all. It all depended on the ground it was on. But I had to use the drivers to keep running up.

Lieut.-Colonel W. L. Davidson:—Might I ask how many men were employed in the running up?

Major Young:—I only had the ordinary detachment of eight men.

Lieut.-Colonel Davidson:—How many working numbers had you for each gun?

Major Young:—I had five working numbers.

The Chairman:—You cannot tell us what the muzzle velocity of your shells was? that is rather important.

Major Young:—425 metres.

The Chairman:—Well, gentlemen, I do not know whether there is anyone else who wishes to ask about this Egyptian Horse Artillery Battery. I do not think we have got very much to learn from it, so far as I can make out. To begin with, I do not know whether you would like to reduce the weight of your shells from 12 lb. to 9 lb., nor do I think that you would care to carry only 27 rounds with the gun; and although they seem to have got great lightness in marching, the performance of the gun as regards recoil when fired does not seem to have been satisfactory. I should think we might almost pass on from that and take the question of the Egyptian Field Batteries, and I will ask Major Abdy to read a letter on that subject.

Major A. J. Abdy:—I have here, Sir, a letter from Major Lawrie, written on the 23rd June, from the Turf Club, Cairo. He says:—

"We have given the new 75 mm. 12½-pr. Maxim-Nordenfeldt Mountain gun a very fair trial, I think, having had two batteries armed with it during the last operations, and having fired, I should say "about eighty or ninety rounds per gun at practice and on service. Also "having marched all the way from Kerma along the river to the Atbara "and back to Berber. We never had any trouble and we are pleased "with the gun. The ordinary shell is 12½ lbs. and it also has an 18 lb. "double shell. The gun makes good practice with shrapnel at 3,600 "yards, and we find the old double shell of 20 lbs. with clinometer at "extreme elevation, making accurate practice at over 3,000 yards. "Muzzle velocity seems low, but it keeps up at long ranges. The "country out here as you know is flat, we never found any difficulty in "carrying the guns on pack saddles, although we draw them as well. "And I am sure there would be no difficulty in India on that account. "They have an excellent saddle interchangeable for all loads, a great "improvement on any I have yet seen, and the whole load including "saddlery runs to about 300 lbs. or under. We altered girths from rope "to web. I have never come across a gun of its size, which I think "could have done what the new one does, and I should recommend you "to keep your eye on it. Two more batteries are being armed with it "here, and I hope about September you may hear some more about "it."

The CHAIRMAN:—I have got here a paper that gives some details about this gun. I find that Messrs. Maxim-Nordenfeldt, in speaking of these guns, say that the calibre of the gun is 2·95 inches; the weight of projectile 12½ lb,; the muzzle velocity 920 feet-seconds, and the weight of gun and carriage complete 880 lbs. divided into four loads, and they say that excellent shrapnel fire was made in Egypt up to 3,800 yards. They also say that the shrapnel 12½ lb. is fuzed with a special fuze of German make; that the ring shell 12½ lb. is fuzed with a special point fuze; the double shell 20 lbs. which is now under conversion to 18 lb. with a larger burster, has a delay-action fuze. Those seem to me to be the details of it. Now is there anyone who wants any further information about it?

Lieut.-Colonel JEFFREYS:—Does it give the rate of fire at all, Sir?

The CHAIRMAN:—Can anyone tell us about the rate of fire? Captain Nicholson you were beside these batteries in Egypt I think.

Captain NICHOLSON:—Yes Sir.

The CHAIRMAN:—Can you tell us anything about what sort of rate of fire they got?

Captain NICHOLSON:—Well, I was rather busy, Sir, but I think I can pretty safely say that they did not fire any faster than we did. Of course their shell and cartridge is all in one, it is a quicker loader.

The CHAIRMAN:—Yes, fixed ammunition.

Captain NICHOLSON:—But my great point about this gun—perhaps I should have no view at all, but I have a view—is that owing to its recoiling so much it makes it uncommonly hard work for anyone; and when you have all your gunners that you have available on the ground, hard at work with your ammunition, pulling the lanyard and loading the gun, you have no men to take the part of these men who are keeping on working the gun; and if you want to fire faster you must have an extra man there to help the loader, the No. 3.

Major-General J. F. MAURICE, C.B.:—It is an extraordinary thing, Sir, but that is the very gun which they claim has no recoil and they call it a quick firing gun because it has no recoil.

Major YOUNG:—I think I may say, Sir, that the officer commanding the battery did not find that difficulty of recoiling.

The CHAIRMAN:—I see that Captain Dawkins at the end of Colonel Elmslie's lecture in describing these guns said "They are armed with the little Maxim-Nordenfeldt gun, a gun which works in a jacket and has hydraulic buffers and springs to check the recoil and bring it back into position." I notice that Messrs. Maxim-Nordenfeldt say: "The Sirdar, Egypt, 25.11.97., states he considers the guns good and suitable for that country" and he says: "*Buffers.* It is a question whether these are necessary with so small a gun, and a longer trail in two parts would apparently answer the purpose, *i.e.*, prevent the gun turning over. These buffers are now supplied and they seem to give no trouble. The buffer rods, or pistons are not well designed to lock the gun, and are liable to twist; the Maxim-Nordenfeldt Company, are, however, improving on this, and the second battery is better arranged with locking catches." Those of us who have seen mountain artillery at work know, of course, that the gun very often turns head over heels; our own 2·5 inch guns often turn head over heels, and this I suppose is an arrangement, judging from what the Sirdar says that is really not to check recoil so much as to prevent the gun turning over. But you, Captain Nicholson, who were beside these guns in action saw this great recoil.

Captain NICHOLSON:—Yes Sir, what I mentioned just now is what took place immediately alongside of me. The left hand gun of that battery was not more than ten yards from the right hand gun of the 32nd Field Battery, which I was then with. And that left hand gun, I will not say the other guns, but this one which was nearest to me I saw recoiling after every round and being run up by the gunners round it, which of course entails a great deal of fatigue.

The CHAIRMAN:—Then again I see Captain Dawkins told us "As regards the rate of fire of those guns, the ammunition, etc., they are not what we call quick-firing guns at all; that is to say there is no man who sits on the trail and works them from the shoulder, and there is no spade or other arrangement to stop the recoil, but the recoil is not very violent, and owing to these large detachments they can get through very quick, and an officer tells me their normal rate of battery fire is about five seconds per round. The ammunition is fixed ammunition, the cartridge and projectile all in one."

Colonel F. G. SLADE, C.B.:—Was Major Lawrie's Battery which fired 513 rounds at Omdurman armed with that gun?

The CHAIRMAN:—Yes. "The expenditure of ammunition in those batteries was very large, especially one battery, the 4th Egyptian battery, commanded by Major Lawrie, which fired no less than 913 rounds—that is over 150 per gun." That is a very great number of rounds per gun.

Major YOUNG :—All the Battery Commanders told me they were not troubled with this recoil, and I constantly talked with them about it.

The CHAIRMAN :—One would naturally think that there would be recoil with a light gun firing a 12½ lb. shell, the whole weight of gun and carriage complete being only 880 lbs.

Colonel SLADE :—And the velocity very low.

The CHAIRMAN :—Yes—you would think naturally it would have a very great recoil, but then you find the velocity is only 920 feet seconds.

Colonel DOWNING :—I do not think as a rule Sir, they ever took the the trouble to run up when they were not in line with the other guns; they kept recoiling backwards, and I think if you recollect we saw the same gun at Eynsford and it recoiled about three yards at each round. That was on the grass.

The CHAIRMAN :—Is there anyone of the Ordnance Committee here who will be able to tell us what is the velocity that the Indian Government have asked for for their new mountain gun ?

Colonel J. G. STONE :—1,420 feet seconds.

The CHAIRMAN :—1,420 feet has been asked for by India for its new mountain gun ; and this, which is really a mountain gun, has 920. I daresay, Colonel Stone, you could tell me another thing : With a muzzle velocity of 920 feet at about what range would the bullets of a 12½ lb. shrapnel be effective according to the formula that each bullet should have so many foot pounds.

Colonel STONE :—I really cannot say off hand, Sir.

The CHAIRMAN :—Roughly : You worked it out the other day, if you remember, that the 10-pounder with a velocity of 1,420 feet would have man-killing effect over 4,000 yards.

Colonel STONE :—Yes Sir.

The CHAIRMAN :—If you calculate this for a 12½ lb. shell with velocity reduced to 920 feet, the shrapnel bullet would only be effective at short ranges, would it not. We will work it out and send it to the Secretary here, and have it put into the "Proceedings" ;* because

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* At the recent discussion at the R.A. Institution on "The Artillery in Egypt," a question was raised as to the limit of range at which the bullets of the shrapnel shell of the 12½-pr. (75 mm.) Maxim-Nordenfeldt Mountain gun would be effective.

The following tables give some comparative data for this gun and the 2·5-inch R.M.L. and 10-pr. B.L. (experimental) guns.

Gun.	Muzzle velocity f.s.	Remaining velocity of projectile.	
		3000 yards range.	4000 yards range.
2·5-inch R.M.L.	1440	724	617
10-pr. B.L.	1420	883	737
12½-pr. Maxim-Nordenfeldt	920	650	587

according to the formula for the effective of shrapnel, my impression is, that with this gun, the shrapnel would not have the proper effect except at short ranges.

Major Young :-- I have got the remaining velocity at 3,400 yards, it is 633 feet.

The Chairman :—Thank you. Does anyone wish to ask any more questions or to say anything about these Egyptian Field guns?

Major H. C. Dunlop :—I should like to ask Major Young how this gun he has been talking of compares with the 15-pr., our gun.

Major Young :—I have never seen any practice with the 15-pr. I have seen this gun practicing a little, and I should say it answered very well indeed, and the recoil is very small, but there is a recoil.

The Chairman : —But you have never seen it compared in any way with our 15-pr., except in the field.

Major Young :—No Sir, never.

The Chairman :—I do not know that there is much more to say about these guns. This gun seems to me to be simply what we should call a mountain gun. It is sent forward by Messrs Maxim-Nordenfeldt themselves as their "75 mm., 12½-pr. Q.F. Mountain gun." Then we were told by Captain Dawkins that it is not a quick-firer; and a mountain gun with 12½ lb. shell, if it is really successful ought to be a very useful gun as a mountain gun, but I do not quite think the

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The following table shows the energy of the bullets in foot-pounds, taking the remaining velocities in the last table and making no allowance for the effect of the burster :—

Nature of gun.	Energy of bullets at 100 yards from burst at range of 4000 yards, in ft.-lbs., *omitting effect of burster.*	
	Bullets of 35 to the pound.	Bullets of 48 to the pound.
2·5-inch	104	—
10-pr. B.L.	141	95
12½-pr. Maxim-Nordenfeldt...	94	—
Energy required by Field Artillery Drill (400 f.s.). ...	71	71

N.B.—There is no information as to the weight of the Maxim-Nordenfeldt bullets, but judging by the number (164) in the shell, they are probably not less than thirty-five to the lb.

Considering that the burster of the Maxim-Nordenfeldt shrapnel is 3 oz. it is obvious that the efficiency of the shrapnel is not limited by any want of energy of the bullets at long ranges, and the same remark applies to the 10-pr. B.L. with base burster, even with bullets forty-eight to the lb. There is some doubt as to the 2·5 inch which has a head burster.

The angles of descent with the Maxim-Nordenfeldt are considerable, and is 25° at 4,000 yards; to obtain good shrapnel effect, therefore. the gun would have to shoot with considerable accuracy and this is hardly to be expected considering its shortness and low velocity. Our 12½-pr. jointed gun, a battery of which is now in India, gave poor results as regards accuracy at any range much exceeding 2,000 yards, though it was a considerably longer gun and had 280 f.s. more muzzle velocity than the Maxim-Nordenfeldt. The effective range of these guns is clearly limited by their accuracy; this is all important in mountain guns which are frequently called upon to fire but few rounds at small bodies of men and have a limited ammunition supply. In our service, guns have now been universally accepted as preferable to howitzers for shrapnel fire, but too high a muzzle velocity brings so many evils with it in light equipments that it may easily be overdone.

Royal Artillery would like to have the muzzle velocity of their field guns reduced to 920 feet seconds. It seems to me that one of the things we are looking forward to now, is to establish the superiority of artillery fire early in the action. All modern tactics are tending in that direction; and to do that we must begin at very considerable ranges. And if we are going to have a 920 feet-second velocity, most certainly our shrapnel will not be effective at anything like long range.

Major H. W. W. BARLOW :—I may mention that we have actually made and tried a jointed 12-pr. gun, weighing 3½ cwt., for mountain service. The low velocity of 1200 f.s., which it is necessary to adopt to avoid the excessive recoil with a light gun and mounting and a comparatively heavy projectile, considerably detracts from its efficiency weight for weight as compared with the 2·5-in. gun, 7 lb. projectile and velocity of 1440 f.s. Such a gun would hardly do for Field Artillery.

The CHAIRMAN :—Now perhaps, Colonel Hunter-Blair, as I am glad to call him, who told us something the other day about the Maxims, will tell us again about them, as I daresay there are officers here who were not present on the last occasion.

Lieut.-Colonel W. C. HUNTER-BLAIR :—Well, Sir, as regards the Maxims, I had six guns when I went up the river, and as I had nothing to go upon I had to organize these six Maxims with some sort of formation, so I took the formation I knew best and thought most suitable, and I organized them as far as possible exactly on the lines of a minature battery of artillery. We had six ·303 guns and they were mounted on infantry travelling carriages. We had to each carriage three mules; these three mules I always hooked all in on the line of march, but it was a very light weight for three mules (except on heavy ground) and on coming into action we generally came into action with shaft mules only, as being more easy to unlimber. We had a detachment of five men to each gun and the battery was divided into three sections in the ordinary way, with a section officer to each; and a great point was made of the sections being independent of each other and detachable if necessary. We had a native driver to each mule. 5,000 rounds of ammunition were carried on each carriage, and we had in addition twenty boxes carried on camels or mules. The whole weight behind the team was only about 12 cwt., so that it was a light gun for three mules even on heavy ground.

As to the fighting of the battery, so far as ranging went, the normal method I adopted was the ordinary bracketting system; that is to say we fired a certain number of rounds, ten or twelve, of rapid fire, then waited to see where the splash of the bullets went and then corrected the elevation accordingly.

The CHAIRMAN :—What sort of range could you get?

Lieut.-Colonel HUNTER-BLAIR :—That of course depended Sir, on the ground, and on the atmosphere. In the Sudan the atmosphere is very clear, and as a rule on the sandy desert, as most of it was, the observation was clear, at any range up to 2,000 or even more yards you could see the splash of the bullets without any difficulty on the desert sand. But I did not always carry that out because it took a little time, and there was a much more simple and much more effective method of ranging which we nearly always did carry out. It was used at Atbara, and I believe also at Omdurman. It was a very simple method which we christened the 'fire-hose' system. It consisted of commencing rapid fire on any point close to the battery and then gradually elevating the gun without looking over the sight at all until the stream of bullets arrived at the object effectively and there you stayed (applause). It sounds rather comical but as a matter of fact it was a most effective method and at places where it would have been impossible to tell where your bullets were going otherwise, it acted most admirably. At the battle of Atbara we opened fire first of all on the line of the stockade on which the Camerons were advancing, and it would have been impossible to see where our bullets were going if we had opened fire straight on the target, because the infantry fire was going on the same point; but by the fire-hose system we ran up the bullets to the stockade and in that way we could tell at once that the bullets were going into the target. I grant that this method would only be possible where the ground was a clear sandy desert and you could see exactly where the bullets were going. As to the effect of the fire of the Maxims one could only of course estimate it; because as a rule there was a tremendous infantry fire on the same objective and it was impossible to pick out ones own bullets from the infantry bullets. At the Atbara during the first part of the attack when we were firing at the line of stockade where the infantry were firing too, we could only judge of the effects of our fire by the way the enemy's fire slackened; but during the latter part of the fight at Atbara I changed the target on to the enemy's extreme right, which was beyond the zone of our infantry's fire, and we fired at that for some considerable time. When we got to the Zareba afterwards, we found the trenches in that particular corner absolutely chock full of dead bodies, so that we had very vivid proof of what our bullets did do. Later on at the same battle when the Zareba was taken and the Dervishes were bolting out of the stockade in rear and trying to double across the open ground to get into the scrub beyond (there was only about 100 yards of open ground between them and the scrub), they came under our fire there and I think there were very few of them that got across that ground. We had had many opportunities of course before of judging of the accuracy of their fire. I was very anxious to know what the Maxims would do at long ranges and was continually carrying out practice before we went up to the battle of Atbara, and certainly the results were wonderful. I have heard it suggested that Maxims are not much good except at short ranges. We fired continually at ranges of 1,500 to 2,000 yards and the results were surprising, and I am satisfied in my own mind that certainly up to 2000 yards they can be depended upon to fire with the greatest accuracy.

There are two points that struck me particularly with regard to the

Maxims during the campaign which are perhaps worth mentioning. The first is that in order to gain the greatest effect from the fire, the Maxims should certainly be for attack on the flank and not in a position where their fire will be liable to be masked by infantry advancing. This was illustrated to a great extent at Atbara. The Egyptian Army Maxims when the infantry advanced, advanced with them and although they did enormously good service no doubt, yet their action was certainly cramped by the fact that they could only fire while the infantry halted; and as a matter of fact Soudanese troops when attacking a position do not halt very often or very long. From our Maxims on the other hand which were on the extreme left flank of our whole line we kept up a continuous rapid fire from the moment we came into action until the Zareba was finally captured and the whole thing was over.

The CHAIRMAN :—What sort of range was it ?

Lieut.-Colonel HUNTER-BLAIR :—I cannot tell you exactly Sir. It was not a long range; I should think it would be from 400 to 600 or 700 yards, but I cannot tell you because by the 'fire-hose' system you do not use your sights.

The other point is that I am quite convinced in my own mind that six Maxims formed into one battery (as ours were) under one Commanding Officer is a much more effective organisation than having them distributed by one's or two's among battalions or brigades. The advantage of having a small and compact unit in camp or on the march is an obvious one; and when you come into action you have that small compact unit with the whole of your men protected from shrapnel or infantry bullets, capable of keeping up a continuous fire of 2,500 rounds a minute (that is only a moderate computation—the actual official rate is more) and that tremendous fire directed by only six men, who are presumably trained to that particular work, and controlled (and easily controlled I can say from experience) by one battery commander who can distribute or concentrate it at any particular moment as he may think necessary.

I think Sir that is all I have to say.

The CHAIRMAN :—What extent of front had your battery in action,—your Maxims ?

Lieut.-Colonel HUNTER-BLAIR :—It varied Sir. We had nothing laid down particularly. When we were in the ordinary normal formation in brigade we were wheel to wheel as close as we could get. When we were at Atbara we had about ten yards between the guns—that was to suit the ground that we came into action on.

General MAURICE, C.B. :—Were they infantry men or artillery men that you had ?

Lieut.-Colonel HUNTER-BLAIR :—They were all artillery men, all men out of my own battery at Cairo.

The CHAIRMAN :—Had you two officers under you ?

Lieut.-Colonel HUNTER-BLAIR :—Yes Sir, two officers.

The CHAIRMAN :—Might I ask you, were these Maxims ever employed with cavalry ?

Lieut-Colonel Hunter-Blair :—No, the men were not mounted. The Egyptian Army Maxims were on galloping carriages and were employed continually with cavalry ?

Captain May, R.N. :—Had you any jams ?

Lieut-Colonel Hunter-Blair :—No we had practically none. When we first started and the men did not know the thing well we had continual jams ; but all the jams we had at practice were from some fault in the detachment, from the men not knowing the work properly ; but the only one we had at Atbara was from defective ammunition, the only round of defective ammunition that I saw the whole time I was there.

An Officer :—How many rounds did they fire from the six guns ?

Lieut.-Colonel Hunter-Blair :—At Atbara it was not a great many ; I think we fired about 7,000 to 8,000 but I am speaking from memory. At Omdurman, I believe, they fired about 40,000 rounds.

The Chairman :—I do not think there is much to be said about the matériel of the Maxims because I suppose we all know that pretty well. But now I do think it might be very interesting if one or two points in connection with tactical matters were raised, like that point. Perhaps General Maurice will say something on that subject.

General Maurice, c.b. :—I was going to suggest Sir that you should first of all ask one or two infantry officers to speak to a point that I know occurred ; that is, that they ranged from the guns with volley firing.

The Chairman :—Yes that came out at Colonel Elmslie's lecture, I think.

General Maurice, c.b. :—I think there were some observations about it there.

The Chairman :—I think now it would be interesting to bring out any tactical points. A letter was read at the last lecture from Colonel Villiers Hatton who commanded the Grenadier Guards. This is what he said. "It appeared to me from what I saw that the artillery fire "throughout was most effective, and that the range was got almost at "once. It was steady and continuous, and (here of course I am alluding "to the 32nd Field Battery), another most important matter was that we "were able to obtain the range direct from the guns. This not only "gets on' the infantry fire at once, but gives confidence, because the "men *know* they are right when they see the shells go home and feel "that from those very shells they get their own sighting." Now we shall be very much obliged if any infantry officers who are here would tell us anything they can about it.

An Officer :—I did not quite catch your question Sir.

General Maurice, c.b. :—We want to know what you saw of the effect of your own volley firing in ranging from artillery. Did you not in volley-firing get your range from the artillery ?

The Chairman :—I am afraid there is no one to answer. Then there are one or two points in connection with the position of these guns which have been raised, and I should like very much to bring them out. Colonel Hunter-Blair told us that he brought his Maxims up to within from 400 to 700 yards of the enemy's position on the flank of the infantry. That was so was it not?

Lieut.-Colonel HUNTER-BLAIR :—Yes Sir, about 400 yards or less.

The CHAIRMAN :—Had you any artillery opposed to you?

Lieut.-Colonel HUNTER-BLAIR :—No Sir not then—there was none. There were some artillery inside the Zareba, but they were not very much in evidence. They fired two shots at the beginning in the early part of the day, and then never any more.

The CHAIRMAN :—Then again I notice that Major Young said at Colonel Elmslie's lecture "Maxims and guns I believe are of the greatest possible value in the very front line, in the line of infantry during attack on positions, and it is only by that immense superiority of fire, which they aid very much in getting, that bodies of troops will be taken in the assault in these days." That question again has been raised by Colonel Hunter-Blair. Is that experience of yours, Major Young, which induces you to say that you think the place for Maxims and guns where they can be of the greatest possible value is in the very front line, beside the infantry, derived from experience in an action where the enemy had artillery against you or is it derived from experience where the enemy had no artillery?

Major YOUNG :—They had ten guns against us, but as Colonel Hunter-Blair has said, they were not much of guns, those little brass mountain guns.

The CHAIRMAN :—I wish General Maurice would say something on that point.

General MAURICE, C.B. :—There are two or three things Sir, that I should like to get out from officers who were there because there is one conclusion that I am inclined to draw generally and I should like to know how far officers who were present can confirm it; that is, that so far as the infantry attack on a position is concerned certainly the impression which this story has left on me is that no accumulation of mere numbers and force of mere infantry apart from artillery fire would have carried that position in any way. It does not matter whether you have Frenchmen, Germans, Russians or even Englishmen to attack the position; they never could have carried it because they never could have approached it.

Lieut.-Colonel HUNTER-BLAIR :—I certainly think so.

Major YOUNG :—Are you talking of the Atbara?

General MAURICE, C.B. :—I am talking of Omdurman.

Major YOUNG :—There was no position carrying at Omdurman.

General MAURICE, C.B. :—Precisely. I say that no accumulation of force against your position consisting of mere numbers of infantry would ever have carried that position. I cannot believe it. Those Dervishes were every bit as ready to have lost their lives as any troops in the world in getting up to that position and the number that they were able to accumulate were as great as could ever effectively be accumulated against any position. Therefore I can see no chance of a mere accumulation of numbers against that position with a rush carrying the position at all. If that is so it is a point of considerable importance to us in our tactical arrangements. At present we count that if we have five or six in number attacking the position to one we are bound to carry it. I do not believe it. My point is that at present it is assumed that if you have six infantry men against an artillery position without artillery fire they will carry it.

The CHAIRMAN :—But then the supposition is that six attacking infantry men will be as well armed as the defending infantry.

Lieut.-Colonel HUNTER-BLAIR :—The supposition is Sir that they would shoot as well. But they did not at Omdurman.

General MAURICE, C.B. :—I grant that; but I am inclined to think that your artillery fire and infantry fire together would have made it impossible for that advance to be made against mere force.

The CHAIRMAN :—Will anyone further speak to this discussion?

General MAURICE, C.B. :—There is one point that Colonel Elmslie raised in talking to me the other day. His impression is that if you could get the howitzer batteries up in the front part of the position (and so far it is a question of a tactical kind) and if they were properly protected by Maxims or some other form of local protection it would come to this, that the enemy must either silence the battery and capture it, or go. I mean that the fire is so appalling from the battery that it would be impossible but that the position should be taken unless the battery were so protected. Therefore it becomes an extremely interesting point in regard to the position of one of these high explosive batteries, they bring so much more destructive than any other power that the battery becomes an object that must be assailed by the enemy.

The CHAIRMAN :—I do not know. One can hardly tell how far that would be borne out by actual experience, because, from some experiments that we have had in the open, I do not think we should get quite as good results from high explosive shells fired with percussion fuzes against troops in any sort of open formation as you would get with shrapnel.

Captain MAY, R.N. :—I may remind you, Sir, that we have often had cases of 6-foot by 6-foot targets within 10 feet of high explosive shell that were not blown down. I am inclined to attribute the good effect at Omdurman to the confined spaces enclosed by walls. There is no doubt that if a shell gets amongst walls or bulk heads it sends things flying far more than in the open.

The CHAIRMAN :—Of course the effect of high explosive shells against such dense masses of men as these Dervishes presented as targets for infantry or artillery would very likely have been awful. But that is altogether an exceptional feature in war is it not?

Colonel F. G. SLADE, C.B. :—There was a story I heard, Sir, of one of these Lyddite shells bursting amongst some mounted Dervishes and they fell like a pack of cards.

Lieut.-Colonel Elmslie :—I have been told by more than one person, Sir (I did not see it myself and I do not know anything about it) "You ought to see those cavalry up there, they are still sitting in their saddles." More than one person told me the same thing.

Colonel F. G. SLADE, C.B. :—And another story I heard of another shell falling into one of the huts at Omdurman where there were nine men sitting round a table and they were found dead still sitting there, killed by the concussion.

The Chairman :—I am a firm believer in these shells being very valuable in any enclosed position, any place where there are walls, or falling inside works, and of course against dense masses of troops; but I do not think they would have a very great effect, from what I have seen, against troops in the open. When I say troops in the open I mean in loose order. If you get them on to great bodies of troops together then of course they would have a very great effect.

I do not know whether there is anything else to be said, gentlemen, and as it is getting rather late, I will just wind up by saying that I think we have had a very interesting discussion, and what I call a pleasant talk over our own business. To me certainly it has been very delightful. I do not know that we have very much to learn from the Egyptian Artillery in the matter of matériel; I do not honestly think we have; and I think it is very satisfactory to find that our own Battery has done as well as any other. For my own part, (and I shall have a great deal of responsibility in connection with the matter now,) I must say that the one thing I am keen about is always to hear and always to learn. I want to know of all the defects and all the faults there are, in order that we may as rapidly as it can possibly be done remedy them, not to shut our eyes or our ears but to learn all we can about what has been tried by other people, so that if it is better than our own we may improve our own by their example. Here I do not think we have much to learn from either the Egyptian Field Artillery or Horse Artillery according to Major Young; but the discussion has been at all events an extremely interesting one, and I am sure you will all join with me in thanking all those who have taken part in the discussion (loud applause).

Major-General Maurice, c.b. :—I am sure, gentlemen, you will all join with me in offering our very grateful thanks to Sir Henry Brackenbury for having initiated the discussion and having come down here to preside over it. I hope we may see him again on some future occasion when we may have an opportunity for the same quiet business discussion, as he says (loud applause).

[It may be of interest to members to know that the foregoing illustrations of the Khartoum expedition were reproduced from the photographs by the Meisenbach zinco photographic process in London, and set up and printed entirely by the soldier printers in the R.A. Institution printing house at Woolwich.—*Secretary R.A.I.*]

LOGARITHMIC SLIDE RULES.

— BY —

MAJOR S. B. VON DONOP, R.A.

HAVING, with permission, introduced the use of the Logarithmic Slide Rule into the Royal Military Academy and having found it extremely useful in solving the many problems connected with the study of gunnery, I have thought that, although a number of Artillery Officers are already in the habit of regularly using the slide rule, yet others may like, perhaps, to have the instrument brought to their notice, and may also, after a little practice, find it equally useful.

The Logarithmic Slide Rule was, I think, first mentioned in the *Proceedings* by Colonel Watkin in a paper published in Vol. XIII., No. 13, July, 1885. In 1895, thanks to Major H. P. Hickman, an "automatic plotter" (invented by that officer) for plotting the observations of Siege Artillery fire was brought into the service and with this plotter two logarithmic slide rules were used. Since then it has been found possible to make the necessary calculations with these slide rules and without the "plotter," still however working on Major Hickman's principle. Thus every officer and many of the non-commissioned officers of a siege company must acquire a knowledge of the use of the slide rule. Special slide rules are used for calculating the perforation of armour and working out automatically other formulæ, and in the *Proceedings* of May, 1895, Major Hansard proposed two for calculating the battery commander's corrections when conducting coast artillery practice.

The instrument in use at the Royal Military Academy is made by Messrs. Davis and Son, Derby, but there are others, both of English and French make, very similar in construction. It is a 10-in. rule, and it must be remembered that a rule of this size can only be used for calculations which do not require more than *three* figures to be accurately found. Longer ones can be obtained if required.

The slide rule consists of two portions, the "rule" and the "slide," and the scales and marks on both sides of these are employed for the various calculations. There is also a cursor or sliding frame provided with a centre hair line.

Looking at the front of the slide rule (Fig. 1) will be observed logarithmic scales arranged in the following order from the top.

A scale of inches on the bevelled edge.

The upper scale on the rule } Similar to each other.
" " " " " slide

The lower scale on the slide } Similar to each other and twice
" " " " " rule the scale of the upper two.

On the reverse of the slide will be found (Figs. 5 and 14) :—

A scale of logarithmic sines (marked *S* at the right end).
" " " logarithms.
" " " logarithmic tangents (marked *T* at the right end).

There are also on the reverse side two recesses or notches with index lines to be used in conjunction with these last three scales.

On moving the slide out to the right when holding it the right side up, there will be seen a scale of inches in the recess in the centre of the rule and by combining this and the scales of inches on each edge of the rule anything up to 20 inches can be measured.

A few words are necessary in order to explain the notation of the rule. In Fig. 1 the cursor will be seen cutting the upper and lower scales on the rule at 21 and 145 respectively, and it will be noticed that by moving it to the right until it reaches the 2 on the lower scale, any number with three figures can be read off and an approximation even of a fourth can be made. Continuing to the right one finds the sub-divisions begin to get smaller and, therefore, are not numbered, and from 20 to 21 there are only five divisions instead of ten. Similarly from 40 to 41 there are only two divisions. Care must be taken when reading from the left end of the lower scale, where the cursor is in Fig. 1, not to forget that the number is 145 and not 45.

It must also be understood that just as when working with logarithm tables the decimal place has to be located afterwards by inspection.

The following are some of the calculations which continually occur in connection with gunnery and also other calculations.

MULTIPLICATION.

Whenever possible use the lower and larger pair of scales.

To multiply 24 by 37 (*i.e.* to *add* the log of 24 to the log of 37) place the left hand 1 on the *slide* over the 24 on the *rule* (see Fig. 1) and under the 37 on the *slide* will be found on the *rule* the reading 888. It is seen that it is something between 885 and 890 and the third figure is easily arrived at by noticing the last figure of each of the factors (*i.e.* the product of four and seven must end in eight). There is nothing on the rule to show whether the answer is 8·88, 88·8, 888 or 8880. A simple rule will suffice. "If in multiplying, the slide has been pulled out to the right, the number of integers in the answer will be *one less* than the sum of the integers in the two factors; if the slide has been moved to the left the sum of the integers in the answer will be *equal* to the sum of the integers in the two factors.

For example 24 × 83. By proceeding as in the former example, the 83 on the *slide* will come outside the *rule* and so the *right hand* 51 on the *slide* must be placed over the 24 on the *rule* and under the 83 on the *slide* will be found 1992, and there will be four figures in the answer according to the rule. If we had to multiply 2·4 × 8·3 the procedure would be exactly the same, but there would be only two integers in the answer, which would, therefore, read 19·92.

Again, 246 × 357 = 87800 by slide rule. (See Fig. 2.) The exact answer is 87822, but in many cases 87800 would be sufficiently accurate.

Another method for locating the decimal point is adopted sometimes as follows :—

To multiply 33 by 245, divide the first factor mentally by 10 and the second by 100, and we get 3·3 × 2·45 = a product 8080. It is seen at a glance the answer is 8·080 ; then multiply by the 1000 (*i.e.* 10 and 100) that the factors had been divided by, and the correct answer 8080 is obtained. The absolutely correct answer is 8085, but as I have already explained the fourth figure can only be an approximation.

DIVISION.

Proceed as in vulgar fractions.

$\frac{83}{24}=\frac{x}{1}$ Using the lower scales (see Fig. 3) put the cursor over the 24 on the *rule*, run the 83 on the *slide* over this and then over the 1 on the *rule* will be found 346 on the *slide*. The rule for the number of integers is "If the slide is out to the right, subtract the number of integers in denominator from that in numerator, the remainder will give number of integers in answer. If the slide is out to the left 1 must be added to this," so that in the above example the answer is 3·46. In simple cases such as this the position of the decimal point can be fixed by mere inspection.

PROPORTION.

$\frac{14}{86} = \frac{x}{62}$ Using the *upper* scales put 86 on the slide under 14 on the *rule*, (see Fig. 4) then above 62 on the *slide* will be found 1·01 (the cursor being used to facilitate the reading).

Using the lower scales the answer could be read more accurately, *i.e.*, 10·45, but so often in proportion the lower scales cannot be used owing to the scales being single, that it is better as a rule to keep to the upper scales for this calculation.

TRIGONOMETRY.

Given angle of descent 51 minutes, find slope of descent.

For any angle under 5° 45′ the sines and tangents may be taken to be the same.

Turn the rule over and pull slide out to the right. A single line or index in the upper side of the notch of the rule will be observed pointing to the scale of sines. Move the slide till the 7° is under the index. (See Fig. 5). It is easy to remember that tan 7° or sin 7° = $\frac{7}{57}$ approximately = $\frac{1}{8}$; now turn the rule over (see Fig. 6) and the left hand 1 on the top scale of the *slide* will be seen under 8·2, thus shewing how the slope will be read off; now move the slide out till the index in the notch at the back points to 51 minutes, and on looking at the front of the rule a slope of $\frac{1}{67\cdot5}$ is read off (see Fig. 7).

For any angle greater than 5° 45′, the left hand notch and index should be used in conjunction with the lower scales. Thus an angle of 15° 10′ gives a slope of $\frac{1}{3\cdot69}$

For angles less than 34 minutes the slide must be removed from the rule turned over and inserted with the scale of sines immediately under the upper scale on the rule. Take 22 minutes for example; place the line that will be found just to the left of the 2° (called the minute index) under the 22 on the right upper scale on the rule, (the cursor is marking it in Fig. 8), then over the extreme left hand mark of the *slide* will be found 64, *i.e.*, tan 22′ = ·0064. In order to locate the decimal point, I find it convenient to paste a piece of paper on the back of the rule and write :—

Sin 90° = 1
„ 5° 45′ = ·1
„ 34′ = ·01
„ 3·4′ = ·001

Now replace the slide in its proper position and work out the following sum of proportion :—

$$\frac{\cdot0064}{1} = \frac{1}{x} \quad i.e. = \frac{1}{156}$$

If any difficulty is experienced in knowing whether the denominator is 156, 15·6 or 1560, a very easy solution is found by noticing that

$$\frac{\cdot0064}{1} = \frac{\cdot64}{100} = \frac{6\cdot4}{1000} = \text{about } \frac{1}{160}$$

To find the angle of descent from the slope of descent, or to find the range finding angle for any range from any given height the work is exactly the converse of the previous examples.

To find the range-finding angle or angle of sight to a point at 1500 yards from a gun mounted 130 feet above sea level.

$\frac{130}{4500} = \frac{13}{450}$ Move the slide until the 13 on the left hand upper scale of the *slide* comes under the 45 on the right hand scale of the *rule.* (See Fig. 9). At the back will be found the angle 1°39′. (See Fig. 10).

To find the square root of a number, for example 73. Place the cursor over the 73 on the right hand upper scale on the rule. (See Fig. 11). Under the cursor on the *lower scale of the rule* will be found the answer 8·55. To find the square root of 7·3 the cursor must be placed over the 73 on the left hand upper scale on the *rule,* and the answer 2·7 will be found on the lower scale of the rule. Hence the rule is to use the left hand upper scale of the rule for finding the square root of numbers with an *uneven* number of integers and the right hand scale for numbers with an *even* number of integers.

To square a number the converse of this procedure must be adopted and the answer will have an odd or even number of integers according as it is found on the left or right hand upper scale on the rule. If any difficulty is experienced in remembering any of these methods, a trial, using well known numbers, will very soon put the operator right.

To take the cube root of a number place the cursor over the number on the upper scale of the rule, say 36 (*i.e.* on the right hand scale, see Fig. 12) then move the slide to the right until some number on the upper scale of the slide coincides with the cursor at the same time that the left hand 1 on the lower scale of the slide is above the same number on the rule. This is the number required. Thus the cube root of 36 is found to be 3·3.

To find the area of a circle, place the long index line marked at 7854 on the right hand upper scale of the slide under the right hand *1* on the rule. Place the cursor over the diameter of the circle on the lower scale of the rule and read off the area in square inches under the cursor on the upper scale of the *slide.*

E.g. Find cubic capacity of a tube 103 inches long and 6 inches in diameter.

Area of the circle = 28·25 square inches. (See Fig. 13).

Then using the lower scales 28·25 × 103 = 2910 cubic inches.

It is often required to solve triangles, as for instance in Siege Artillery practice where the base and all three angles are known.

$$\text{Then} \quad \frac{a}{Sin\ A} = \frac{b}{Sin\ B}$$

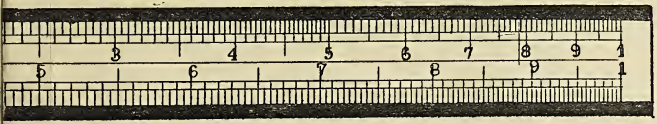
Reverse the slide so that the scale of sines is under the upper scale of the rule. Place *Sin A* under the length of *a* and over *Sin B* will be found *b* (see Fig. 14).

$$\frac{300}{Sin\ 13^\circ} = \frac{x}{Sin\ 70^\circ} = \frac{1255}{Sin\ 70^\circ}$$

Only a few examples illustrating the use of the logarithmic slide rules have been given, but it is hoped that they are sufficient to show how to manipulate it and also to prove how useful the knowledge of the instrument ought to be to those officers whose work often entails making calculations. It is particularly useful in working out the same example with one factor continually changing, such as the angle of sight for different ranges from a gun mounted at a particular height above sea level. It is also most convenient to use it for seeing at a glance the percentage of marks gained in an examination by each member of a class when the maximum is not exactly 100.

The slide rule can be easily applied for the conversion of scales in connection with military topography work, while for examination purposes it is distinctly valuable to check roughly and quickly any calculations for which, owing to the want of more than three figures, its use has been prohibited in the first instance.

(PLATE I.)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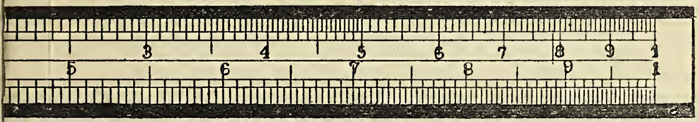
5 6 7 8 9 1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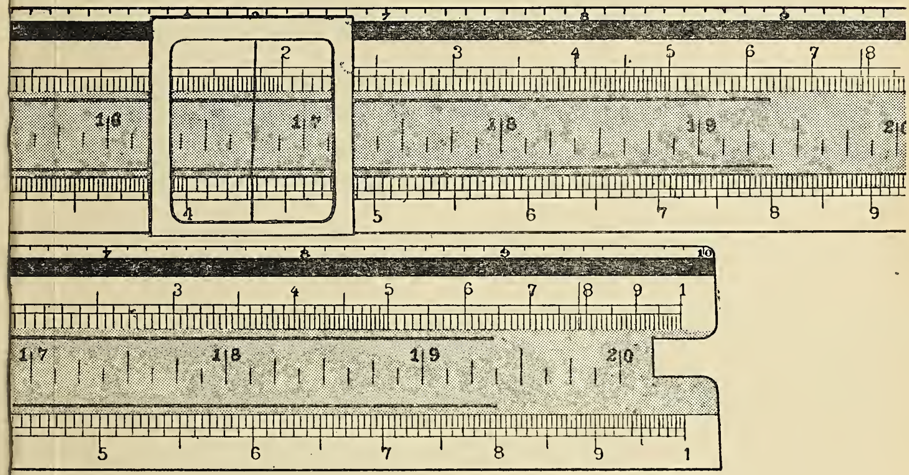
5 6 7 8 9 1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2 3 4 5 6 7 8
1|6 1|7 1|8 1|9 2|0
4 5 6 7 8 9
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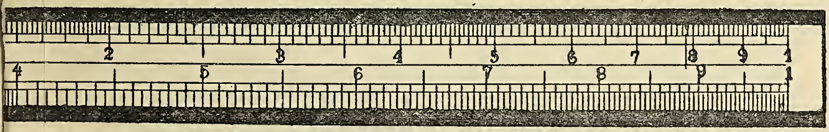
5 6 7 8 9 1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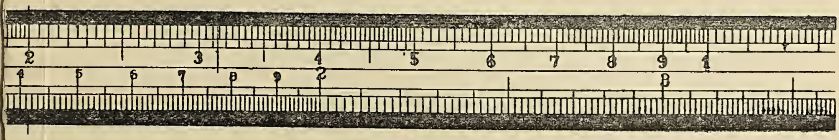
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4 5 6 7 8 9 2 8

Fig. I

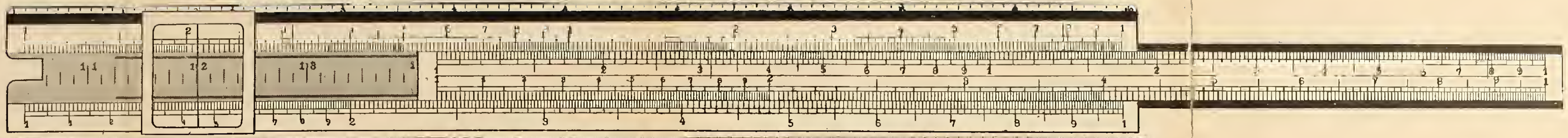


Fig. II

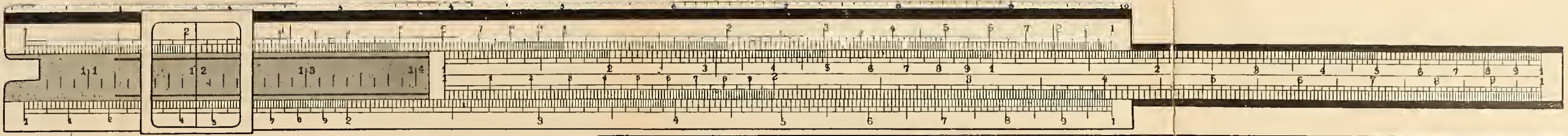


Fig. III

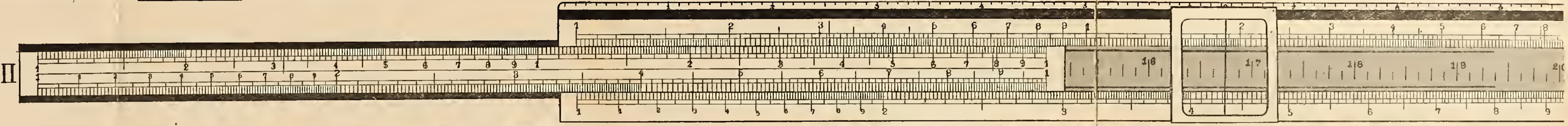
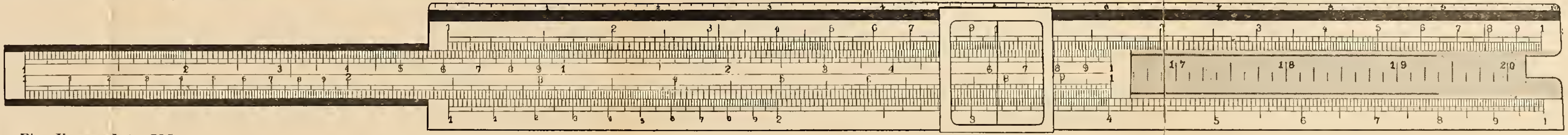


Fig. IV



Note: For Fig. V. see plate III.

Fig. VI

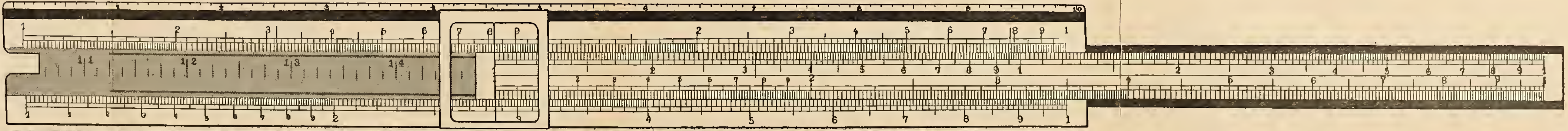
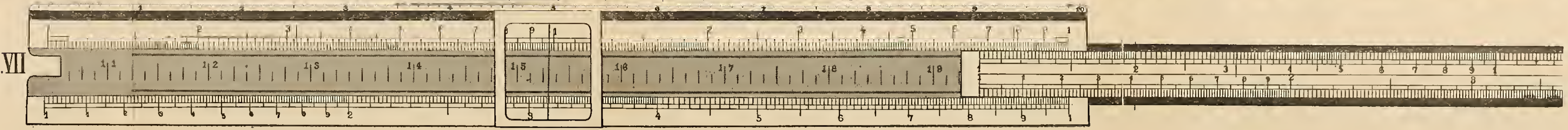
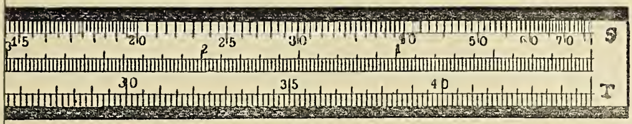


Fig. VII



(*PLATE II.*)



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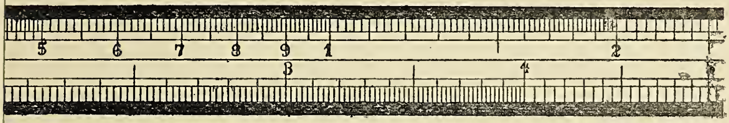
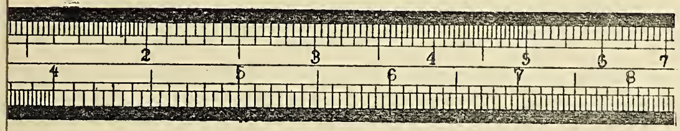




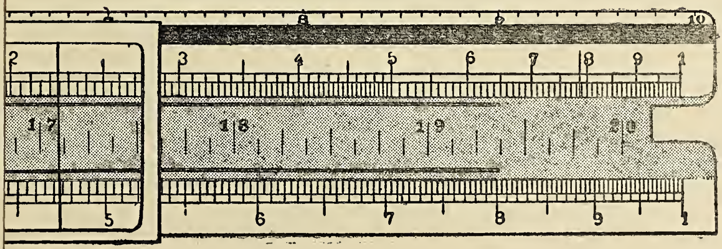


Fig. VIII

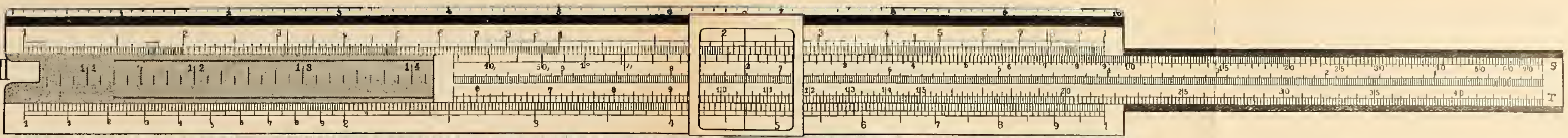
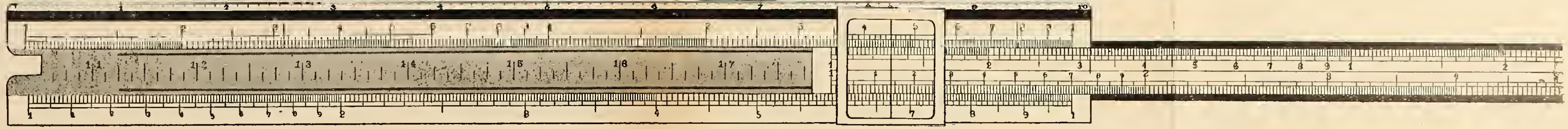


Fig. IX



Note: For Fig. X. see plate III.

Fig. XI

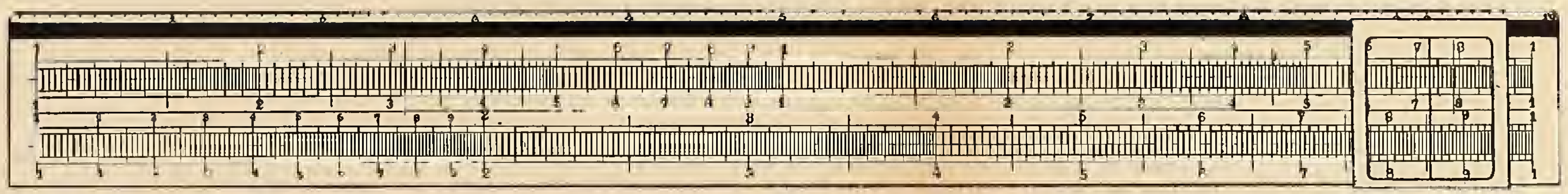


Fig. XII

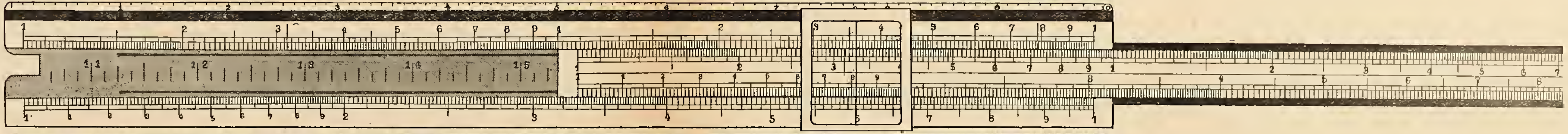


Fig. XIII

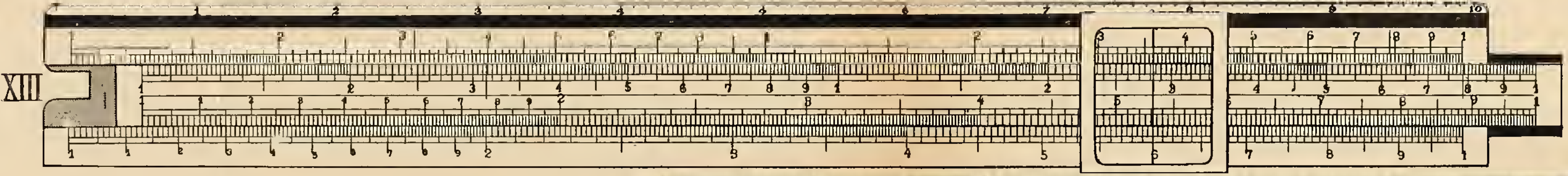
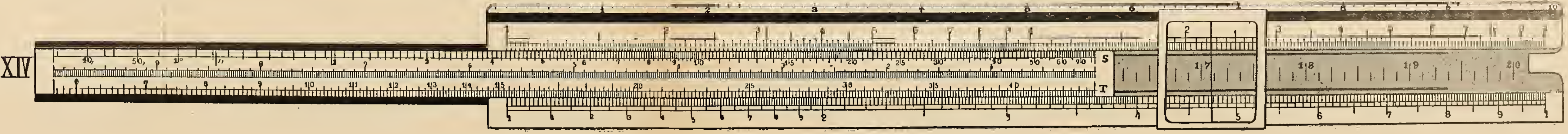
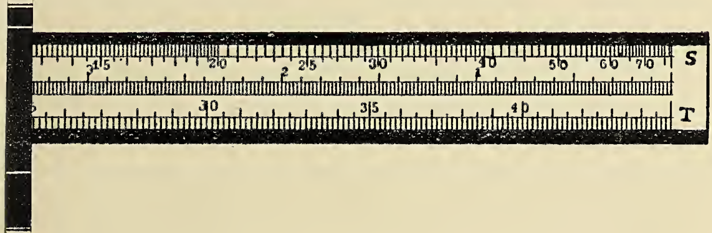
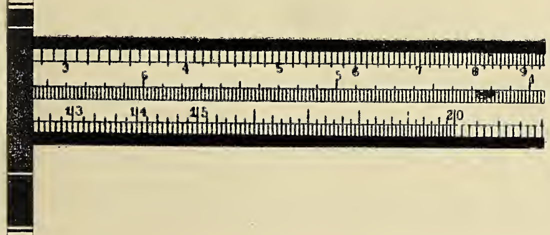


Fig. XIV



(*PLATE III.*)





R.A.I. PROCEEDINGS,
No. 2. VOL. XXVI.

(PLATE III.)

Fig V

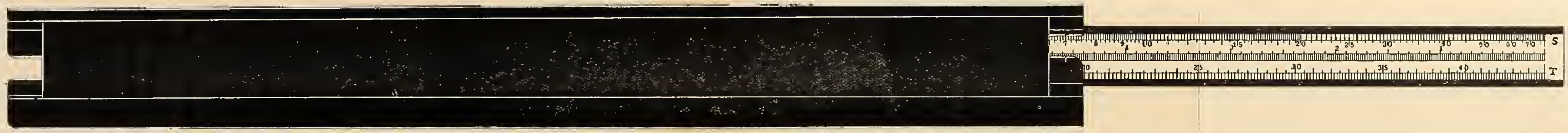
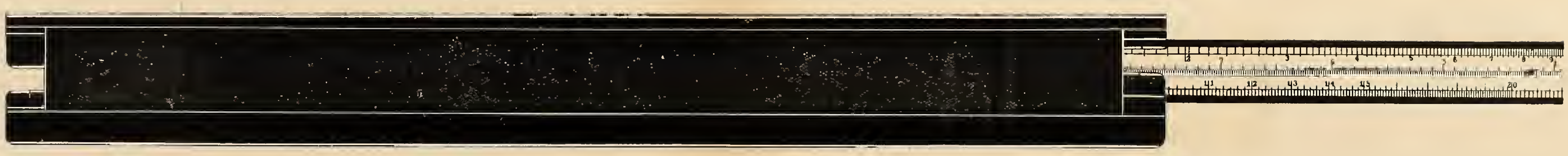


Fig X



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THE TRANS-SIBERIAN RAILWAY.

BY

LIEUT.-COLONEL W. H. H. WATERS, *M.V.O.*, D.A.A.G.

(*A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday 8th Dec., 1898*).

COLONEL F. A. YORKE, R.A., IN THE CHAIR.

THE CHAIRMAN :—Ladies and Gentlemen, you will allow me to introduce to you Colonel W. H. H. Waters, who is kindly going to give us the Lecture; although some of us may not know him personally, we all know him very well by name (applause).

Lieut.-Colonel WATERS :—Colonel Yorke, ladies and gentlemen, I will ask you to allow me to make a few preliminary remarks.

In the first place you will understand that, being on full pay, I had to subject my lecture to the approval of the Authorities at the Foreign Office, who were my late masters, and therefore, I shall be obliged to read it, and keep to what I have laid before them. I am also, of course, precluded from entering into a discussion of any political theories; I do not know that they would interest you very much if I did, but, at any rate, I am not allowed to do so.

Then there is another thing that I very much regret, which is, that I have no lantern slides. I took a camera with me to Siberia, which acted very well at first, but, unfortunately, when I got to a place on the Amur river, I met a party of Chinese soldiers dressed in petticoats and I hired them to allow me to photograph them ; at that particular moment my camera went wrong, and it never acted again until it was repaired after my return to England.

The title, to which my attention was drawn by an announcement in the press, is rather a *misnomer*, because it is stated that I am to give a lecture on the Trans-Siberian Railroad; although the greater part of the paper is devoted more or less directly to that subject, still I thought it well to introduce a few other items of greater or less interest besides merely the railway.

In discoursing briefly on the huge dependency of Russia, called Siberia, it is somewhat difficult to decide what to say and what to omit. Too much vagueness would render it altogether devoid of interest, while too many details would weary any audience not especially interested in the country.

The map before you is drawn on a scale of sixty-six miles to an inch and even then it is a very large one. But the superficial area of Siberia is about 5,000,000 square miles, in other words it is some forty times larger than the United Kingdom. Divided from Russia in Europe by the low range of hills called the Ural Mountains, a fact which strikes the imagination is, that one can travel from the Baltic to the Pacific without quitting the boundaries of the Russian Empire.

But whereas the size of Siberia is so vast, the population still only amounts to about 10,000,000 inhabitants, scattered over the land, so that nowhere is it dense, while, in most places, it is extremely sparse. The country, on the whole, is flat rather than hilly, and one can best picture it in winter as being an almost boundless sheet of snow and ice. The towns are few and far between, in the sense in which we know them, the largest being Irkutsk, situated in the heart of Siberia, with a population of some 60,000 souls; on the other hand many contain only 2,000 people.

Speaking generally, the new-comers have pressed continually eastwards. A Russian village consists of one long street with a single row of cottages on either side, and the immigration into Siberia may be said, so far, to have followed the same lines, nor is this unnatural: finding no fresh physical obstacles to progress towards the east, new comers mostly went thither, instead of meeting with, perhaps, still greater hardships by striking off to the north or to the south.

With very few exceptions the houses are built of wood, and as the interstices between the planks are carefully filled up, it is not difficult by the aid of good stoves, to maintain a sufficiently high temperature during the cold months of the year. In summer time the weather is mostly warm and agreeable except, of course, towards the regions in the far north.

The capabilities of the soil are quite astonishing. In the west especially, the grain growing area is not only immense but it is also very fertile. When the snow has melted, some five milliards of acres are capable of producing almost every description of cereal, vegetable, fruit or plant. Even in those more easterly regions, where the ground is always frozen except for a few inches below the surface, the fertility of the ground is something remarkable, the wild vine flourishing well and producing wine of a quite drinkable quality. The sources of wealth already mentioned would be, of themselves, sufficient to give commercial importance to a country, but there are others which far surpass them in value. It is not, I venture to think, practicable to give even a slight but accurate sketch of Siberia without employing words which give the idea of immensity. Siberia is immense in many ways already and will unquestionably become greater as time goes on. Apart, then, from the potential wealth to be produced by the soil, there are other sources buried in it. These are the mineral riches, of which nearly, if not every kind, is known to exist in enormous quantities. The beds of coal are so huge that even in those regions where it has been proved to exist, nothing like an accurate computation of their area has yet been made, and it may here be mentioned that the forests are so immense, both with regard to their extent and the size of their trees, that, with a fair system of afforestation, they can supply any quantity of fuel that may be required for generations upon generations to come. But Siberia has other things besides coal, for lead, copper, silver, asbestos, potash, and many other valuable resources exist in great abundance. Chief among them is gold. Russia stands about fifth on the list of the world's gold producers; her supply comes from Siberia. Yet this industry, like others in that country, is still in its infancy. The precious metal obtained is almost entirely alluvial and even this source of supply, large as is now the annual output, has scarcely been more than tapped. But the quartz reefs, which must exist, since without them there could by no possibility be any alluvial gold, still await the mining engineer.

In many parts of Australia the scarcity or absence of water has been a prime factor in retarding progress, but this does not apply to Siberia. Some of the greatest rivers in the world are to be found there, such as the Ob, the Yenisei, the Amur, and the Lena; the last named flows out of Lake Baikal, which has a superficial area of about 12,000 square miles. Besides the streams just mentioned, there are many others too numerous to mention here.

The three following reasons may be given as explaining why Siberia, with her practically unlimited resources, is still in a comparatively undeveloped stage. They are : sparseness of population, the severity of the climate and the absence of good communications.

The Russian Empire is of such an extent, comprising as it does, with a total population of about 130,000,000, one seventh part of the globe that the actual struggle for existence there has not yet of necessity made the inhabitants very energetic. The comparatively small population has also mitigated against any particular region becoming densely inhabited. But the severity of the climate in Siberia has likewise been a potent factor in retarding the development of that country, although the residents have adapted themselves to their environment. In St. Petersburg, for example, people rarely skate if the thermometer shows more than 18° Fahrenheit, but, at Omsk, on the other hand, I saw young children on the ice when the mercury marked 45° of cold.

Either of the two causes just mentioned would suffice to retard the opening up of a country, but another one, at least as important, remains to be discussed, viz., the absence hitherto of good communications. This would be bad enough in a small land, but its ill effects are aggravated in Siberia, where the distances are so immense. In those places where good roads, railways or steamship routes exist, the Russians are not slow to take advantage of them, and it is worth while going into some detail on this subject.

Let us commence by taking a case in point:—From Tobolsk to Stryetensk the distance is 2,767 miles and recruits drawn at the former place for service at Vladivostok, used, until quite lately, to start from there in November and march to Stryetensk, whence they were forwarded in barges, when navigation opened, to their destination. Now it will be conceded that a journey of such a length, even under favourable conditions, is a great apprenticeship for a youngster and would teach him to march, the average length of each day's journey, including halts, being a little over twenty miles. But the conditions were most unfavourable. The road would be covered by snow, broken into innumerable ruts caused by the long caravans bringing tea overland to Europe from China; many hundreds of sleighs pass daily. The thermometer would show an average of about 45° Fahrenheit of frost, often more, while the wind is so biting that one must feel it in order to really appreciate its violence and cold. I know that there is a theory, propounded by some people who have never visited Siberia, that although the temperature is very low, the air is still. I can assure you that this is often, if not generally, a complete delusion.

It may be thought that the instance which I have quoted, of a long march is quite an exceptional case, but this is not so. You will readily understand that it could not be, when the distance between the important towns is taken into consideration. From Krasnoyarsk to Irkutsk is 693 miles, from Stryetensk to Blagovyestchensk is 768 miles and many similar instances could be quoted.

Before the Siberian railway was commenced a few years ago, there was in reality only one great artery of communication in the country, which was open throughout the year. This is the "great Siberian road" extending from the west as far eastwards as Stryetensk, where it ends.

Thence towards Vladivostok, communication in the summer months was and is maintained by means of river steamers and barges, and, in the winter, a track for sleighing is made on the frozen stream. This is often, indeed generally, desperately rough, as the swift current, the numerous bends and varying breadths of the Shilka and Amur, cause the ice to pack, thus giving anything but a smooth surface. In the spring and autumn months, when the ice is either melting or forming, the only means of communication for the distance of 1411 miles from Stryetensk to Khabarovsk, the capital of the Priamur military district, is pack transport, necessarily very slow and uncertain. At such times even the mails are delayed for months, letters and a very few light packets only being despatched, and they are not infrequently lost.

Various other circumstances, unnecessary to specify here, have helped for many years, indeed for some centuries, to keep Siberia in the background. Little known to Russians, and still less to others, it was looked upon as a land of darkness, a home, if home it could be called, for exiles. But this state of things could not last for an indefinite period, and when the present Emperor of Russia visited the country in 1891, its development was then really taken in hand. This had already been decided upon in principle, but opinions in Russia had been divided. All were agreed that communications must be made, but while one party urged the construction of a railroad, another, with equal vehemence, argued that the great Siberian carriage road should be continued from Stryetensk eastwards. The advocates of the former scheme pointed out with truth, that Canada had not waited to build the Canadian Pacific railway until she should first have a carriageable track across the continent, and they added, with equal truth, that in the United States of America there existed about 200,000 miles of railroad, although the carriage roads were not, on the whole, such as might have been expected from such a progressive nation.

The arguments of the opponents of the Siberian line amounted to this, that to make it without first constructing a road, would closely resemble trying to run before one had learned to walk.

Especially when we think of the tremendous distances in Siberia, is it difficult to see how any doubt could have existed as to the advantages in favour of the railway project. Apart altogether from any political or military schemes, it was known that incalculable wealth of almost every description existed in the country, and that this could not possibly be utilised to any considerable extent without safe, comparatively rapid, and cheap means of communication, which could only be given by a railway. When I was at Chita, in the heart of Siberia, the transport of goods thither from Europe cost about £30 a ton. When the through line is opened it may amount to £5, consequently the actual necessaries of daily life were enormously expensive, even salt costing four and a half times as much as in Europe, so that although wages were about twice as high in Siberia, the earners of them gained but little, if at all, in many cases.

As we all know, however, the railway project was adopted, and although a French syndicate had wanted to construct the line on terms advantageous to Russia, the government of that country decided to make it an Imperial undertaking.

Work was and is carried on at several places, far distant from one another at the same time, and, when the difficulties connected with the labour supply, the carriage of materials, and the severe climate are considered, it is certain that the work done reflects the very highest credit on those responsible for its execution.

The line is a single one, of the normal Russian gauge of 5 feet, and the stations, situated in often quite uninhabited localities, are about twenty miles apart. But since there are sidings, long enough for trains to pass each other about every five or six miles, the railway is, for practical purposes, almost a double line.

Soon after it was put in hand, people in Russia who had seriously considered the problem, began to believe that the line which was to cost at least forty millions sterling, could not have its main terminus at Vladivostok, a name which signifies "Ruler of the East." In the first place that harbour of magnificent dimensions may be closed for only, perhaps, ten days by ice in winter, as was the case when I was there. But it may be, and sometimes is frozen up for several weeks or some months. Modern ice breakers can, it is true cut channels, as the ice is never very thick, but they may also break down when wanted, and in any case a few open canals cannot by any possibility afford the same facilities that an unfrozen port offers. Not only is this so, but it seems doubtful whether Vladivostok harbour will not, in time silt up, unless expensive dredging operations be carried out.

The Amur river forms the boundary between Siberia and Manchuria for a distance of more than 1,100 miles between Pokrovskaya and Khabarovsk.

Now a line built along the banks of the river would be liable to frequent damage from floods, and it would have to follow the course of the stream owing to the configuration of the ground. Last year, damage estimated at about £1,000,000, was done to the railway by inundations in Transbaikalia, therefore it is not surprising that the route across Manchuria, shorter by many hundreds of miles than the other, should have been selected as regards Vladivostok. But there still remained the disadvantage inherent to that port itself, and it therefore followed that an ice free harbour, necessarily lying further to the south, was a question seriously discussed and, finally decided upon in principle, a considerable time before any practical steps were taken in this direction.

Russia if she wished to develop Siberia's immense resources, was obliged to seek for a free outlet to the Pacific, as well as inland; otherwise even an ordinary winter would have placed her at a disadvantage from the point of view of trade. The western terminus of the railway is at Chelyabinsk in the Urals, whence to Vladivostok by the old purely Siberian route is a distance of more than 4,700 miles, while the railway to the latter (across Manchuria) from Europe will still be by far the most stupendous undertaking of its kind in the whole world.

When this railway is completed, probably even sooner, other great main lines will be constructed, such as a railroad from the Siberian track at Omsk to Tashkent, the capital of Turkestan; a line, too, will run from Orenburg to the Asiatic systems and Russia will then have her more distant possessions in direct and rapid communication with her two capitals, St. Petersburg and Moscow.

The extent to which the railway now under construction has influenced Siberia is already something quite remarkable. Portions of it are thrown open for provisional traffic, as soon as completed, and before the ballasting work has been properly done. Full advantage is taken of this, and whereas the population of Chila, which the railway from Europe has not yet reached, was about 5,000 souls three or four years ago, it amounted when I was there to 15,000 persons.

It must not be supposed that the speed is high, for it is not. Trains run, including stoppages, which in Russia are long and in Siberia abnormally so, at the rate of about twelve miles an hour, but this is very much faster than any other mode of locomotion there, and would be quite sufficient to account for the rush of people it has brought to the country. With a line, unballasted in many places, with sharp curves and a hastily improvised personnel, owing to the large and increasing demand for railway servants, the speed is quite high enough at present, but, in the future, it will be increased.

It is now time to observe more closely the advantages conferred by the railway.

In 1895 two field batteries were ordered to go from Ryazan, not far from Moscow, to Nerchinsk, a distance of 4,164 miles. The railway had been laid, and provisionally opened as far as Omsk; thither from Ryazan the distance is 1,987 miles, and the time taken by the troop trains, including two halts of one day each, was fifteen days. I may parenthetically remark that I have often had ponies sent from the Caucasus to St Petersburg by train, 1,600 miles or so, and they never had more than one halt on the journey. The average speed of the batteries was therefore, 5½ miles an hour, including stoppages.

Let us now see how quickly one can drive under the most favourable conditions. In my time the railway ended close to Krasnoyarsk, so that I had to look forward to covering over 3,000 miles in an open sleigh. With ponies specially kept for me, owing to the courtesy of all the Russian authorities concerned, I took 153 hours to travel 693 miles from Krasnoyarsk to Irkutsk. I stopped only for a morning and evening meal of tea and black bread (boiling water is all that can be counted upon getting at post stations), and the performance was, thanks to the help so generously afforded me, a very good one. Yet the average rate was only 4½ miles an hour with myself and all my baggage in one sleigh. But the private traveller is apt to fare badly on frequented routes. I met a man on that same journey who was in a hurry to reach Moscow; he had taken nine days to cover 350 miles, an average of a little more than a mile and a half per hour.

It is, perhaps, worth while to explain the reason why unavoidable delays occur. Each post station maintains a stable of, perhaps, three dozen ponies. Ragged unkempt little animals they are, but their speed and endurance are wonderful. I have often travelled fourteen miles in an hour with a heavy load, from three to six ponies being used, according to the condition of the road or track. If more than four are required, the remainder are generally harnessed in front of the four wheelers. Where time is lost, when animals are available, is at the post stations on changing teams. Of the total establishment, a certain number are required so many times weekly for the mails, then come people who, travelling officially, are entitled to take horses from other less fortunate passengers, and, last in order of supply, come purely private travellers. Their position is certainly an aggravating one, but there is no help for it, especially of late when traffic of all kinds is much more heavy than it used to be.

The rates of travelling by rail or road in Siberia having been already given, it is now necessary to state the facts respecting the two remaining modes of locomotion, riding and marching. With pack transport about forty miles daily can be covered, which is about 1⅔ miles an hour.

As regards marching, let us take typical instances. The first one is offered by the two field batteries which were sent by train to Omsk. From that place to Irkutsk they marched, the gunners being mostly on foot. The distance is 1,637 miles and took seventy days, of which sixty were marching ones. The average speed was, therefore, including halts, not quite one mile an hour, or a little over twenty-three miles a day. More than this, the relative rate of marching did not fall off but actually increased as time went on. The latter part of this particular march, from Nijne-Udinsk to Irkutsk, 312 miles, took thirteen days without a halt, an average of just one mile hourly, or twenty-four miles a day. During this period of time (thirteen days) the batteries had to cross five unbridged rivers. Now these batteries were merely typical ones of their kind and offer, therefore, an excellent example of the endurance of Russian troops and horses. I have seen the men and horses which performed the feat; the latter are much smaller than ours and draw a slightly heavier weight than in our service. The Russian light field gun and limber weighing over a hundred-weight more than with us, while their ammunition wagon exceeds ours by 3½ hundred-weight.

At the risk of wearying you, I will venture to give one more example. In the winter of 1895–6, two officers, one surgeon, 240 men and 383 horses continued their journey eastwards from Nerchinsk, starting about the middle of November. There is no road beyond Stryetensk, sixty-five miles east of Nerchinsk, and this detachment, composed mainly of recruits, marched on the rough ice of the frozen Amur river. The thermometer fell to 40° below zero Fahrenheit and the horses had, of course, no shelter at night.

After leaving 142 recruits at their station, Blagovyeshchensk, the remainder reached Khabarovsk, on the 2nd and 4th of February. They had marched 1,386 miles from Nerchinsk in seventy-five days including halts, the average length of each day's march being nearly eighteen miles, or three quarters of a mile hourly. Only three men were sick, but twenty-nine horses had been abandoned on the way, the remaining 354 reaching Khabarovsk in satisfactory condition. Thus we see that the rate of progression of even a small body of men is less than half what one or two people can do with pack transport.

The above data, therefore, prove beyond doubt that even a moderately equipped railway will transport bodies of men of some size faster than an individual driving day and night can possibly travel, while the speed on such a line is at least five times more rapid than that attainable by marching. Hence the utility of the railway is open to no sort of question, for its advantages apply equally well to commerce and civilian transport as they do to troops.

The Siberian line is, therefore, a great step in advance towards the development of the multiform resources of the country. But it must not be supposed that, prior to its commencement, Siberia was a bleak waste. It was certainly cut off from the rest of the world to a considerable extent, but it nevertheless contained an industrious and intelligent population and many very wealthy merchants. No doubt the exiles, many of whom were highly educated men, helped the spread of education both by marrying and settling down in the country, and by teaching others as a supplementary means of livelihood.

There are men in Siberia who are entirely self-made. Some of them began life as illiterate recruits, but took advantage of the regimental schools to acquire some sort of primary education.

Having saved a very few pounds, during their period of service in the ranks, they subsequently started small general stores, with the result that they to-day are worth many hundreds of thousands of pounds, and are highly respected and deservedly influential members of the community.

During my residence of five years in Russia, I travelled all over that Empire both in Europe and in Asia and at all seasons of the year. I was often struck by the neglect, shown towards it by English capitalists, engineers, merchants and others. In days gone by many of our compatriots rapidly made enormous fortunes in European Russia, but the time for that has passed, too many other people desiring also to participate in the advantages which she offers. There are, however, numerous other regions where success unquestionably awaits those who will work, who know the language, and who understand the Russian national character. Foremost among these regions stands Siberia. I have no hesitation in saying that, granted the conditions just stated, any young man possessed of very scanty capital, can be worth, in less than fifteen years, a hundred thousand pounds. A man, with more means originally at his disposal, can naturally accumulate riches still more rapidly. It is not to be doubted that, if people in England would learn some facts about Siberia, that country would then, probably, be appreciated at something like its real value as a field for enterprise.

Some people allege that there is no proper security for investing capital in the Russian Empire. Nothing could be further from the truth. If capitalists will only take the trouble to study the laws of Russia, they will find every possible security everywhere in it. I know that the Ministers of State wish for foreign capital in order to develop the resources and they will see that it is properly protected. But, in return for this, they require that the Russian laws on the subject should be obeyed. Not long ago a great industrial company was brought out, not in Russia, and backed by men of the highest standing, financial and other. As they had not, however, taken the trouble to comply with the Russian law, which they had not consulted, the shareholders were liable to lose the whole of what they had believed to be their property. This could have been legally taken from them without compensation. As a matter of fact, however, the Russian Government in its desire to encourage foreign enterprise, was obliging enough to allow the error to be rectified. One has only to know of the large number of Belgians, engaged in profitable undertakings in Russia, in order to learn that those astute men of business find the conditions sufficiently liberal. At any rate they amass wealth. Even during the Crimean war Russia paid the interest on her bonds to those Englishmen who held them and many of the latter remained in the country during the struggle, under the personal protection of the Emperor Nicholas I. For a lecture of this description, I cannot, I confess, think of any better evidence to prove that ample security for foreigners and their capital are to be found in Russia, and it is amazing, to those who know the country, that we do not avail ourselves of the advantages offered.

As circumstances compelled me to visit Siberia during the winter months, it may, perhaps, be worth while to briefly describe how I made my sledge journey of more than 3,000 miles. This vehicle is a kind of oblong basket, fixed, a few inches above the ground, on stout runners, the driver being perched upon a small seat in front. The baggage is arranged underneath the traveller, and is covered with hay, in order to make the improvised seat a little more soft. Since the thermometer often marks 70, 80 and sometimes 90° of frost Fahrenheit and as the wind is extremely bitter, the clothing must be such as to keep the body sufficiently warm, although no amount of it will keep out the cold for an indefinite period unless there is movement of the limbs. The requisites are a fur lined jacket reaching to below the waist and buttoning close up to the throat, long and thick felt boots, reaching to the knees, a reindeer cloak down to the ankles and of which the collar turns up higher than the head, a fur cap with nose and ear flaps, a comforter and fingerless warm gloves. The reindeer cloak is lined with fur also. For a drive, many hundreds of miles long, the difficulty is to prevent the collar of this "dakhá," as it is called, from becoming hard frozen, when you have ice on the face; one cannot stand the wind without protection. When I arrived at Irkutsk, I found my room almost insupportably hot; yet the temperature was only 60° Fahrenheit. This shows what it, when on the road, must have been, and sixteen hours elapsed before the collar of my "dakhá" was thoroughly thawed and dry again. A rug is also necessary, when sleighing, to draw up over the knees, so as to prevent the cold getting underneath the clothes. It is very easy to get frost-bitten when asleep and then, of course, the worst may happen.

It might be supposed that, when driving on a frozen river, the thicker the ice the greater the safety. But this is not always the case. Towards the latter part of the winter, water comes down to the river from the mountains in China. Now in places, the rivers freeze to the very bottom, so intense is the cold. When this water encounters a solid wall of ice one of two things must happen. Either the accumulated pressure of the water carries away the ice wall, leaving ice on the surface sufficiently thick for traffic, or else, if the barrier be too stout, the water forces its way to the top and there forms a layer, two feet or more in depth and varying in area according to the slope of the ice, its roughness, and the bends of the river. These "Nályedis" as they are termed, the word signifying water on the ice, often form very rapidly; in the daytime it is a beautiful sight to see the evaporated water forming white wreaths in the sunshine, but at night the case is much more serious, for the traveller is often into one without any warning. As he is only a few inches above the water, he runs the risk of getting his legs wet and losing them by frost-bite.

On very broad rivers, such as the Selenga which flows into lake Baikal, great rifts sometimes occur in the ice, and if the driver be careless and misses the track, the whole turn-out, human beings, horses and conveyance are lost. I drove across lake Baikal, just after it had been frozen over. The distance, as the crow flies, was thirty miles, and, therefore, further than from England to France. In many places the ice, mostly several yards thick, was desperately rough and it was extraordinary how the ponies trotted or galloped over it. A safer route existed round the southern end of the great sheet of water, but it was many miles longer. It is round that end that the railway will have to go in winter, a steam ferry being used in the summer for the trains. But the engineering difficulties must cause tremendous expenditure of money, as the high mountains from China came right up to the waters edge.

Before very long, however, the traveller will be able to go from London to the Pacific by changing only at Dover, Ostend and Wirballen, at the Russian western frontier, where the break of gauge occurs.

I suppose that no lecture on Siberia would be considered at all worthy of the name unless some allusion were made in it to the exiles.

Most people are aware that, as a general rule, foreigners have depicted their sufferings as being of the most horrible description. With regard to this, I must first point out that these travellers were usually dependent on interpreters for the statements which they published, while others again had first been primed by revolutionary refugees, who, having fled from Russia, still continued, at a safe distance, to incite others in their own country to agitation and worse. Now my sources of information were obtained at first hand, not only in the towns but when I was actually on the road. The most bigoted Russophobe could scarcely, I imagine, suggest that parties of exiles could have been dotted along my route at spots, sometimes hundreds of miles away from an inhabited centre, and officially prepared for my catching them up.

First of all let us take the case of the convicts. I have seen many scores of them in various places. They are persons who have been sentenced by a court of law to a term of hard labour for several years. There is, I should mention, no death penalty in Russia except for high treason or by sentence of a court martial and it is exceedingly rare for this sentence to be carried out; even when a man, sentenced for repeated murders, is at last sent before a military court, the penalty of death is generally commuted to another term of hard labour.

Convicts before setting out on their journey eastwards are provided with excellent warm and new clothing; so tender is the Russian Government that felt pads are even provided, called "pódkandaly" to wear underneath the light leg fetters, in order that the skin may not be damaged. On arriving at his destination a convict is kept in confinement for, perhaps, three years. Afterwards he is allowed his liberty but has to perform a moderate daily task, the rest of his time being at his own disposal, and he generally makes use of it to earn often considerable sums of money. Later on you may find him employed as a footman in the service of some high official. Hard labour in Siberia is child's play as compared with the same punishment in this country and it is a well known fact that convicts often counsel their friends in European Russia to commit some crime which will ensure their transportation.

A lower class of exile is the "exile settler." He is sent to Siberia on the petition, generally, of his fellow villagers in Europe, as being a worthless wastrel, who expects the village commune to support him. He is not kept in confinement.

The most interesting class of exiles is, of course, that known abroad under the head of "politicals." The term is a *misnomer*, for the number of political prisoners is now exceedingly small, as a matter of fact. But there are some thousands of "administrative" exiles. These are people who have committed some offence or other against the laws but not of an actual revolutionary nature. A good many enthusiastic students fall into this category, but Siberia, it must be confessed, cools their ardour and they generally become useful and respected citizens.

Time does not permit me to disprove at length the false allegations so often recklessly made concerning Russian cruelty. The Russian nature is an essentially kind one and now let us see what happened to Poles exiled for taking part in the rebellion of 1863, and who might reasonably have been expected to suffer accordingly. Some of them have told me that, after being captured in action, with arms in their hands, they were sent to Siberia. In those days, the journey was very different to what it is now, when about a couple of thousand miles of rail, in that country alone, help the traveller on his way. Then the march was indeed of appalling length. The military escort was strict, but it was obviously desirable to prevent the prisoners from holding communication with others. The inhabitants, however, were uniformly kind. Many of these Poles have since regained their civil rights and are at liberty to return to their own homes or to go wherever they like. Some of them, ex-revolutionists as they are, occupy to-day posts under the Government. This instance will, I trust, induce you to believe, what is the truth, that political or administrative exiles are not harshly treated; they suffer no greater hardships than do others who live in the same district; after a brief probationary period they are free to live where they choose in Siberia, and in many cases they became wealthy and much esteemed men, doing a great deal of good.

The coloured map before you, to turn now to another subject, shows graphically how Russia has advanced, in spite of herself, from Europe towards the Far East.

She long ago commenced to have relations with China, and at one time some Russians formed part of the Chinese Emperor's body-guard. Gradually, by very slow degrees, an advance into what is now Siberia but was then China, was made, but not without the white men, whose resources were of the scantiest, suffering reverses from time to time. The Russian struggles had always ended in their gaining some advantage, but, in those days, their efforts were desultory and without any definite aim. As we all know, great changes come slowly and when nations are ripe for them. Nethertheless the Emperor of China eventually found the Russians established at what is now a wretched townlet on the Amur river, Albazin by name. Though they numbered but 450 men, the ruler of the celestial Empire was a far-seeing monarch. He viewed with apprehension the approach of the Europeans by land, although, in what intercourse the Chinese had already had with them, the Russians were much preferred to those other white men who had come from over the sea and who, unlike the former, had often interfered in the affairs of the country. A Chinese force of 15,000 men, with 150 guns, was accordingly sent against Albazin. The result of the conflict, all the circumstances of the case considered, could not be doubtful. The Russians were beaten but, of course, by no means disgraced and those prisoners, who were sent to Pekin, were very honourably treated.

When Peter the Great came to the throne, he decided on opening definite relations with China and he, therefore, despatched a mission to Pekin, connected with trading purposes, in the year 1719. How the relative positions of the two Empires have been altered since that date, the map before you shows.

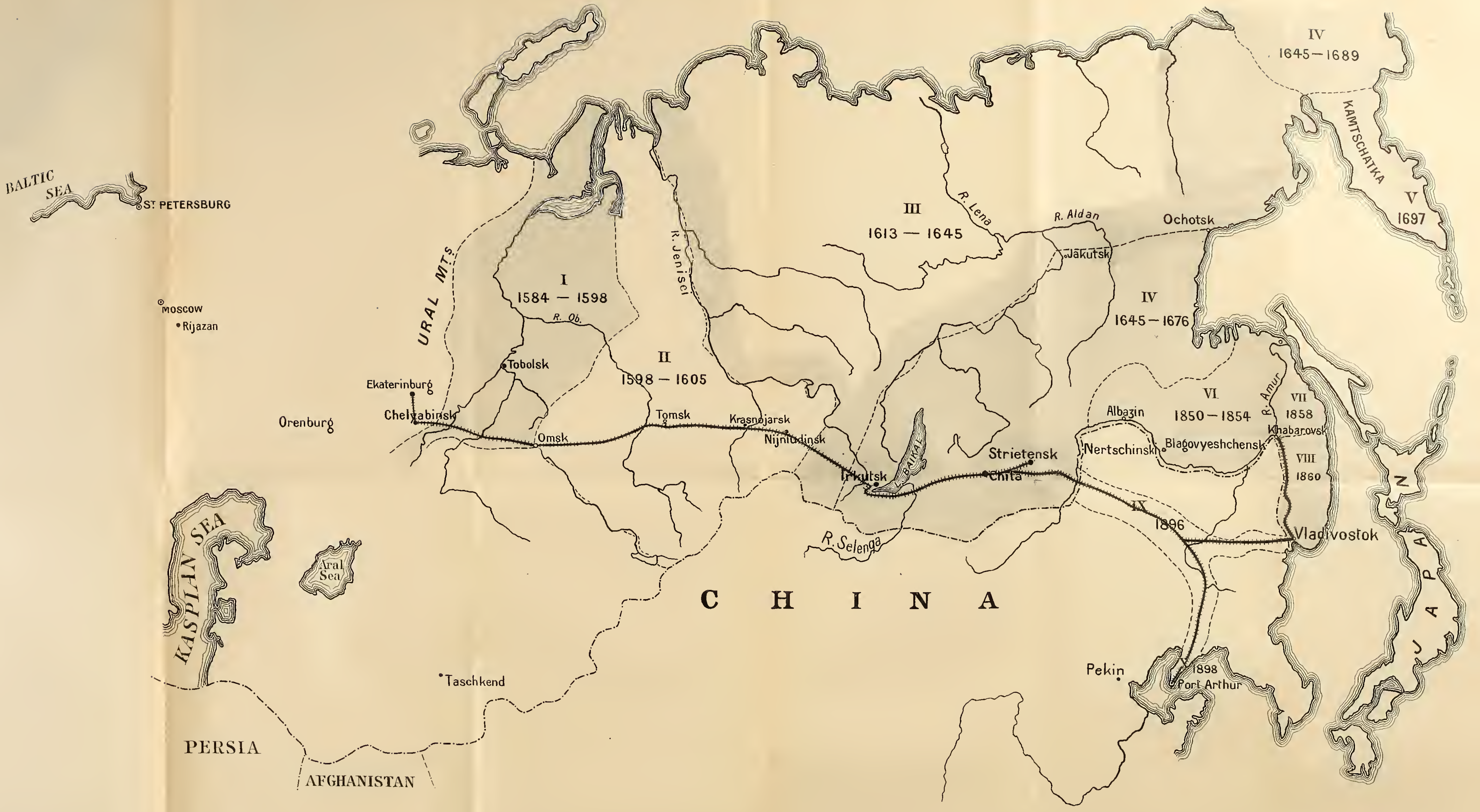
One has so often read of the secret massing of relatively vast numbers of troops in Asiatic Russia, that it may be well to state the facts of the case: five years ago there were in Asiatic Russia, in round numbers, 100,000 soldiers, while to-day, after the acquisition of Port Arthur and Talienwan, the garrisons amount to 117,000 men. Nobody can suppose that these figures will not be eventually increased, but, on the other hand, nobody can truthfully assert that the establishments are anything but moderate, when all the circumstances of the case are taken into consideration. Let me add that Russia is sincerely desirous of peace.

I have often wondered why the majority of people in this country, so so far at least, as I have been able to judge, have formed the entirely inadequate conception of the mighty Russian Empire which they appear to have conceived. We have many traits in common with its inhabitants. Centuries ago, and subsequently, intimate relations existed between England and Russia and I venture to assert that, to-day, no foreigners are, personally, better esteemed there than we are. As regards myself, it would be impossible for me to speak in sufficiently cordial terms of the kindness, not only private but official, which I received during the five years spent by me in Russia, and upon which I shall always look back as having been one of the happiest periods of my life. Having travelled all over her dominions I can say that I speak with the authority of knowledge on these points.

Time being limited I must now say a few words in conclusion. It is a universal law that "the growth of a society as a whole takes place most over regions where the obstacles to be overcome are least." Siberia, with its stupendous resources, affords an excellent demonstration of the truth of this law. Its developement has now been commenced in earnest. "Industrial progress, in common with progress at large, originally insensible in its rate, has become appreciable only in the course of ages, and only in modern times has become rapid. While the forces conducive to it have been continually increasing, resisting forces, both external and internal, have been continually decreasing; until at length the speed has become such that the improvements which science and enterprise have achived during this century, are greater in amount than those achieved during all past centuries put together." I quote these words of a celebrated writer, because they apply with special force to Siberia, which must become one of the most important regions on the face of the globe, both from a self-supporting as well as from a distributing point of view.

At the conclusion of the lecture, in the course of which Major-General J. F. Maurice, C.B., took the chair.

The CHAIRMAN:—Does any one desire to ask any questions? I do not suppose that there are many questions any one has to ask (after a pause) therefore I think I may simply in your name offer a very cordial vote of thanks to the lecturer for the very interesting lecture he has given us, and I am very sorry I was not here earlier to hear the first part of it (applause).



OUTLINE MAP TO ILLUSTRATE COL. WATERS' LECTURE.

Scale, $\frac{1}{15,000,000}$

Railways finished or under construction shewn thus ━┿━┿━

Gradual Expansion of Russia Eastwards shewn by Light Shading.

OUR WORKING HORSES.

— BY —

CAPTAIN C. G. MACKENZIE, R.A.

HAVING to visit lately, in the course of duty, upwards of 20,000 of the working horses of London, and other large cities, I thought that a few notes might possibly interest those officers of the Regiment, (and they are the great majority) who care about stable management.

Bus & Tram Horses. What must I think, strike anyone making such a series of visits, is the comfort and well-being of the animals we are apt to look upon as four-legged slaves, namely the bus and tram horses. No doubt the last decade has seen a great improvement in their condition, because the older stables visited, built before this period, still leave much to be desired; but it has evidently been impressed on the larger business associations, (which in these days of keen competition, must get full value out of every shilling expended,) that the truest economy is to spare no reasonable expense in housing their horses healthily, and in feeding them liberally, both as to quality and quantity.

The consequence is a very small percentage of sickness, and a considerably increased life of usefulness. These same remarks apply to the Railway Companies, and other large employers of equine labour, who suffer however in this one thing, that their hours of work cannot be quite as regular as those of the bus and tram companies.

Cab Horses. Far lower down in the social scale as regards health and comfort, come the cab horses, who, luckily for themselves, spend a considerable portion of the day in the open air.

Horses undoubtedly, like human beings, have a faculty for adapting themselves to most unpropitious surroundings, and occasionally are found looking sleek and well in badly ventilated ill-drained stables, so that the unthinking may be tempted to ask "why go to the expense of housing them better"? The answer of course is that in case of epidemics, always likely to occur, especially in a large city, the mortality in these foul stables will be out of all proportion, great.

The best stables I saw in London, belonged to a firm of wine merchants, and were quite unnecessarily luxurious, consisting chiefly of loose boxes, and the stalls fitted with mat-covered partitions. The head of the firm is however a well known breeder and lover of horses of all kinds, and evidently grudges no expense for the comfort of his working animals.

Feeding. The system of feeding is very much the same in all the stables I visited, and consists of three feeds a day of chop. The amount varies with the size of the animal, from 36 to 30 lbs. a day, half of which is grain. This last consists chiefly of crushed oats, mixed with Indian corn, beans or peas, according to the state of the market and the season of the year. Most of the foremen seemed to prefer split peas to beans as being less heating. **Cost.** The average cost of a London working horse's food, including his bed, is 7/6 per week. The quality in all cases seemed excellent, though of course the oats are foreign. The companies have their own mills where they crush their corn, cut the hay, and mix the chop. They rarely buy the mixture ready-made as it is then apt to be largely composed of rubbish. **Mashes.** There is a great diversity of practice as regards mashes. In several stables, horses, unless ill, were never mashed, and were I am bound to say, looking perfectly well and healthy, their coats bright and skin loose, but it must be remembered that these horses were doing very regular and pretty severe work. I am quite sure that gentlemen's horses and troopers, whose work is as a rule considerably lighter, are better for change to laxative food at least once a week.

Hay. No long hay is given unless a horse is on the sick list. There can be no doubt that this is sound economy, as horses waste a certain proportion of the hay stuffed into their racks, by trampling it under foot. The reason generally given for allowing it is, that having hay to pick at, gives the horses something to do, and keeps them from kicking and biting at their neighbours. Personally I don't believe much in this, as the extra time taken by the horse's picking at his long hay, is a very small proportion of his idle moments.

Litter. Straw as bedding is practically unknown, and there can be no doubt whatever that for practical purposes peat moss makes a thoroughly good bed, and it is of course immensely cheaper. Taking the allowance per horse of moss litter to be $\frac{1}{4}$ cwt. a week against straw $\frac{1}{2}$ cwt., the cost per horse of moss litter equals 6d. against straw (at 50/- a ton,) 1/3, which in a large stud of horses makes a very considerable difference in their annual cost.

The only valid objection to its use that I can see is its appearance. It is often supposed to affect the feet, but the veterinary surgeon in charge of a stud of 6,000 horses assured me that this has only been the case when both litter and feet have been neglected. Doubtless the litter requires a certain amount of careful attention but so does straw, if you wish to have sweet stables, and comfortable beds.

The moss litter should be constantly raked over, and all dung and portions soaked in urine removed as soon as possible. In Lancashire sawdust is used very largely, and apparently with no ill result, though personally I would prefer moss litter.

In the above remarks I am only referring to working horses, which have to be kept as cheaply as is compatible with their well being, and

I am not advocating its adoption for hunters except in the summer, when I believe they do as well if not better on it than on straw.

Labour. The work performed by the labouring horse of great cities varies considerably, but as far as I could gather, the average might be taken at 120 miles a week. Tram and bus horses do not necessarily get their weekly sabbath, in many instances only one complete day's rest a month, and in one large tram stable never a day of rest unless sick. This I venture to think false economy, believing that all labourers will do their work better and last longer if allowed one days complete rest out of seven day's work.

As regards the loads, a heavy bus weighs 2 tons, and carries thirty people of say 10 stone = 1 ton 17 cwt., making total weight 3 tons 17 cwt., or 1 ton 18 cwt. per horse. This compared with 7 cwt. behind each of our gun horses, would seem very heavy, but it must be remembered that the work is done at a uniform pace of between six and seven miles an hour on good roads; with no weight on the horses backs. A tram car weighs 3 tons, which with forty-five passengers of 10 stone, brings the total weight to 5 tons 16 cwt. I am not skilled enough in mathematical mechanics to know how this compares with the load drawn by bus horses, although it is obvious that the tram horses must have a fairly easy time except when starting their load, and when going up hill. They last longer than their comrades in the buses. The average working life of this class of horse may be roughly taken at

Cab horses four years.
Bus „ five years.
Tram „ six years.

at the end of which period they still have some years of useful labour in them, and are readily bought by farmers and others for slow work.

It is a mistake to imagine, as I used to, that the hansom-cab horses of London are recruited from the brutes and screws sent to Tattersall's and Aldridge's. Of the "Growler" horses I know nothing. They are a class apart, and we do not register them, but in all the hansom-cab stables which I visited there were a large proportion of fresh young Irish horses, and the proprietors assured me, (and they had no reason for concealing the truth) that it would never pay them to buy haphazard at auctions, with the idea that anything would do for a cab. The bus horses are recruited from much the same class as our draught horses, though I may safely say that we get the best of the class as remounts. I often hear people comparing these horses in the London streets, to those in our gun teams, not always to the advantage of the latter. It is an unfair comparison. The athlete in training against the ordinary man taking the ordinary every day amount of exercise, the one full of muscle gained by hard work and a liberal allowance of corn, and the other looking as well as possible on two hours not very severe exercise and 10 pounds of oats.

The tram horses are a somewhat smaller and cheaper race, but are good short-legged, compact horses, and would make excellent general utility animals.

Foreigners. Another thing that strikes anyone visiting these stables is the large number of "Yankees", a name which includes any horses imported from the American continent. You meet them in every stable, though it is difficult to get an unprejudiced opinion as to their merits. Some foremen averred that "they could not do with them at any price,"that they were soft, and not too sound, and altogether inferior to the native article. In the largest tram stud in London about 40% of the horses are admitted to be foreigners, and no complaints were made. They are rather better looking than our home-bred horses of the same class, and though I would fain not to believe it, are, when acclimatised, equally useful. Their legs and feet seem as good, and they are rather more free from those curses of heavy horses—sidebones and ringbones. I hope and believe that the best English or Irish horse, whether thoroughbred or cart, is the best in the world, and that our colonies and foreign countries will continue to come to us for stallions and brood mares, as they do for breeding stock of other kinds. There would seem to be something in the climate of these islands favourable to the breeding of the best; but there is no reason for shutting our eyes to the good average results attained by others, results largely due to greater care in selection of sound parents, and partly, no doubt, to the advantages of fresh pasture, and boundless space. Our farmers are often too careless in choosing both sire and dam, putting the cheapest stallion they can get to a worn out or unsound mare. Land here too is frequently, though unavoidably, over horsed, than which nothing is worse for successful breeding, as an experienced breeder, Sir Walter Gilbey, has often pointed out. One thing is certain, importers on a large scale can land good sound useful horses at about £25 a head, which is far less than the British farmer can afford to sell them at.

The temper of these "foreigners" is supposed to be more uncertain than that of their English cousins, but of this I have had little or no experience.

It would surprise many of our drivers to see the number of horses to be cleaned and fed by one man. As a rule the stables are divided into lots of ten or twelve horses entirely looked after by one stableman. He is well paid, earning from twenty-four to thirty shillings a week, but he must have a hard day's work to do his horses properly; yet most of those in the tram and bus stables, looked clean and well, and in many instances I ran my hand through their coat without finding the least trace of scurf, and should be quite satisfied were my troop horses equally clean. The stables, (I am still referring to those of the bus and tram companies) were on the whole kept clean, sweet, and well ventilated. The best are those containing only twelve horses, six stalls each side. These are preferable to larger ones, in which case the horses next to the door have to have too much ventilation especially in windy weather, and those in the centre do not get enough.

Drainage. Several of the newest had no drains at all, the floors being simply swept clean. In these there was no trace of ammonia. Under ground drains of any kind are an abomination. There is nearly always a smell from the traps, which are continually getting out of order. If drains have to be used, the drain should be an open one, and should be carried out at least three yards from the stables, where it should be properly trapped before going into the sewer or cess pit. These town stables go up for two or three stories. There appears to be no reasonable objection to this practice. The horses go up and down the inclines without any difficulty, and it seems far preferable, from sanitary reasons as regards men, and from the point of view of resting the horses, to our system of having barrack rooms above the stables.

Bails. One thing that struck me as being a great improvement on our system was the bails. These are invariably wooden planks, about one foot broad by two inches thick, suspended from the manger in front and the ceiling behind. The best which I saw were used by the South London Tram Co., and were fastened so that the least weight downwards on the bail released it, so that if a horse got his leg over it, there was no danger of his being hung up. The foreman told me that there is not much kicking at these bails, as a horse gets no satisfaction kicking at a swinging board which emits no sound. Personally I have always thought our system of iron bails attached to posts in rear of the horses, to be very faulty. The posts are a great temptation to a kicker, and disfiguring to him if he yields to it, and I can only think of one use for them, namely as a support for saddlery. This however is of itself an evil, as it is very bad for the appointments to be kept in the stables, and a separate harness room would be in every way better.

Mangers. The mangers in general use are also in my opinion an improvement on ours. They are removable, and therefore easily cleaned, and are provided with two bars on either side of the horse's nose when it is in the manger, which stops him moving his head to and fro and so spilling half his corn in the way some animals do.

Sickness. Sickness among these animals is almost unknown, and accidents very rare. I do not like to give figures without longer experience, but in many stables I only saw about 3% of the horses unable to work, which, considering the chance of accidents in the streets of great cities, is a very small percentage, and speaks well both for drivers and horse keepers. It shews that more of the ills, horse-flesh as well as mankind, is heir to, arise from too little rather than too much work. All kinds of accidents both in the stable and out of it are due to idleness.

With regard to this, Major Smith, of the Army Veterinary Department, whose experience amongst these horses is far greater than mine, says that this paragraph gives an unduly favourable impression. These companies have considerable sickness and mortality among their young horses, which are kept when sick, at farms, and which I would not have seen. Their chief complaints are lung disease among the young horses, and bowel complaint amongst the older ones. I am convinced however of one thing, namely, that a considerable proportion of our lameness in and out of the stable is due to insufficient exercise, rather than too much work.

One thing one cannot help noticing going round these stables, and that is the quite marked difference between the condition of horses in various stables of the same yard, horses of exactly the same stamp, kept under precisely similar circumstances as regards housing, feeding and work. One man would have his twelve horses looking pounds better than his next door neighbour. However zealous the foreman, in a stud of over 100 horses much has to be left to the individuality of the horse-keeper, and anyone interested in horses could almost sort these men according to their merits by going round the various stables. A fair level of health and usefulness can be attained by following a rule of thumb, by obeying, in our case, the rules on stable management given in the Queen's Regulations, but to get the most out of our horses, more than this is required. It is necessary for all concerned, from the Major of the battery down to the team driver to closely observe every small point which bears on the comfort and well-being of their charges, and to study as far as possible their individual characteristics, especially in the case of the better bred and more highly strung animals. With some men this is a gift, but it can be acquired by all of us, if we are really fond of "the noble animal." There is nothing that makes a young officer take an interest in these things so much as the possession and care of a horse of his own, and for this reason, if for no other, I am convinced that it will be a bad day for the mounted branches of our service, if the young officers are not encouraged in every possible way to go in for those sports which induce them to keep up a stable, however modest. I know there are some people who think that this subject, that of stable management, is beneath the notice of educated minds. I hope our young fellows will never be taught to think so, and if I may venture to offer advice, I would urge them to lose no opportunity of getting instruction in this most fascinating subject. If a man gets keen on it the midday stable hour, instead of being an hour of drudgery with intervals of coffee-housing, will become an unfailing source of interest and he will find if he keeps his eyes open that he is daily learning something new, to the great advantage of his horses and himself. Whatever other claims we Artillerymen have on our time, and in these days they are great and increasing, I hope we shall never go back in our attention and zeal for our horses, or we shall throw away a quality of almost equal importance to good shooting, a quality in which I believe we have always been pre-eminent, the mobility of our batteries.

AUTO-SIGHTING.

— BY —

COLONEL SIR G. S. CLARKE, K.C.M.G., F.R.S., R.E.

IN the "Proceedings" of the R.A. Institution, for June, 1898, Colonel H. S. S. Watkin, C.B., gives a most lucid explanation of the principles involved in auto-sighting, and provides diagrams showing two partial solutions of the problem. That problem may be shortly defined as follows:—

Given the height of the gun above the sea-level at any moment, the angle of depression of the line of sight evidently determines the range. It is required, by mechanical arrangements connecting the line of sight with the gun, to ensure that when the former is laid on the water-line of any floating target, the latter shall automatically take up the quadrant elevation corresponding to the range. As the tail cannot wag the dog, so the sight must be moved by the gun, the latter being elevated or depressed till the former comes "on" with the target.

Such are the theoretical conditions to be fulfilled; but subsidiary difficulties are involved. It is necessary, in all cases where the rise and fall of tide is considerable, to provide a suitable correction. It is further necessary to be able to correct for the various disturbing causes comprehended in the term "error of the day," causes which combine to prevent the gun from shooting true to its range table.

While I have nothing but admiration for Colonel Watkin's handling of the theoretical considerations appertaining to auto-sighting, I disagree absolutely with his conclusions that auto-sights are of use only in exceptional cases and that there is "danger" in "supposing that they can take the place generally of the present methods of laying guns." The only danger, in my opinion, is that the immense advantages which auto-sighting offers to the Garrison Artilleryman may not be adequately and promptly realized. As large numbers of auto-sights are in course of manufacture, it seems desirable to attempt to allay the misgivings to which Colonel Watkin's able paper must evidently give rise.

His forebodings are based upon the two following objections:—

1. The errors of observation are so great that accuracy cannot be expected.
2. The "serious errors" due to eccentricities on the part of the "racers" will suffice to vitiate auto-sighting even if (1) could be eliminated.

I propose to deal with these two objections.

1. "The actual errors of laying an automatic sight in 1897 when tried by a committee of experts" are given in a tabular form and present an alarming appearance. With a height of gun of 150 feet, the error recorded at 3,900 yards was 890 yards, which is evidently prohibitive. The auto-sight employed was, however, merely a device for moving the back sight. The line was taken by the unaided eye over sights of service type. If such sights were affixed to the excellent D.R.F. or P.F. instrument, I think that the errors would be found to be surprising; but this only proves that, except at comparatively short ranges, the unaided eye is prone to deceive, and even the difference between a "fine" and a "full" sight is considerable. With the D.R.F. and the P.F., therefore, a telescope was found to be essential. In the case of an auto-sight, the same need obviously arises, and for the same cause. As Colonel Watkin points out "in certain weathers, in fog and with powder smoke hanging about, a telescope cannot always be used with advantage"; but there will not be much "powder smoke" in the actions of the near future, and as regards certain weathers and fog, what is sauce for the D.R.F. or P.F. is clearly sauce for the auto-sight. Practical experience has brought out in the most striking way the fact that the telescope could be most effectively used in conditions which rendered ordinary sights absolutely useless. Except in the case of short ranges, a telescope is an essential feature of an auto-sight, and the failure to recognize this axiom is the reason that neither of the arrangements described by Colonel Watkin can fulfil the necessary requirements. Auto-sighting apart, the telescope sight which has hitherto been a monopoly of the mounted branches, will prove an immense gain to the Garrison gunner. The purely observation errors introduced will be no more and no less than those which arise in using the D.R.F.

2. The question of securing the verticality of the axis about which the gun traverses is extremely important; but I am inclined to demur to the expression "want of level of the emplacement, platform, etc.," which suggests that half-a-dozen or more things have to be accurately adjusted. Auto-sighting, if the best results are to be obained from it, demands that the level of the racer path shall be true within narrow limits. Its application "to the older form of guns and platforms is out of the question," as Colonel Watkin quite correctly states. It would obviously be unsuited to a 64-pr. on a Garrison standing carriage; it would confer no advantage on a 9-in. R.M.L. gun standing on weak and wavy racers. I well remember an expensive fort in which the rear racers of slight section were attached to wooden chocks *nailed* between floor joists! In such a case and in many others I should certainly not recommend any attempt to employ auto-sighting. We are not, however, concerned with the past. It would be unprofitable to apply a water-tube boiler to a Newcomen engine or a quick-firing breech mechanism to a demi-culverin. An invention can justly be criticised only in regard to the conditions of the times at which it appears.

Colonel Watkin has given figures showing the effect in the case of a 6-in. gun of tilting the racer path "4′ down to the point," the assumed height of the gun being fifty feet. In this case at 4,000 yards, the range-finding angle—that is the angle of depression of the line of sight—is 14·3′. Deducting 4′, we have a range-finding angle corresponding to 5,564 yards, and at 5,564 yards 4′ will shorten the range by thirty-two yards. The range obtained, in these conditions, will therefore be 5,532 yards, involving an error of 5,532 − 4,000 yards = + 1,532 yards.

The tilting of the racer path is, however, much more likely to be in the other direction, or down to the rear because the effect of recoil creates this tendency. If 4′ is added to the range-finding angle of 14·3′, the corresponding range is 3,131 yards. Adding forty-five yards due to the increase of 4′, the range becomes 3,176 and the error is 3,176 − 4,000 yards = — 824 yards. Such an error is of course inadmissible; but it differs materially from 1,532 yards and might, therefore, have received mention in an analysis of the situation. It should also be noticed that the error tends to diminish rapidly as the range-finding angle approximates to the angle of descent.

While an inspection of Colonel Watkin's table would naturally lead to the conclusion that an inclination of 4′ would render the use of an auto-sight impossible, the actual facts differ materially. I am inclined to think that the auto-sight has been regarded as a range-finder and criticised from this point of view. This is clearly a misconception. A range-finder is an instrument for finding and *accurately recording* ranges. It does not concern itself with the shooting of the gun and such matters. On the other hand, the auto-sight is a device enabling a range-finder to be dispensed with. It has nothing to do with the recording of ranges and it must take account of conditions which the range-finder ignores.

No gun shoots exactly to its range table and for various reasons there arises what is conveniently if vaguely called the "error of the day." Theory lends us no assistance in eliminating this error, and we have to fall back upon the method employed by our ancestors long before sights or range-finders were in existence. In other words, we must observe the fall of the projectile, estimate the error of range and correct accordingly. The auto-sight provides the means of correcting in accordance with such an observation, and evidently errors due to inclination of the racer path are included in the correction.

For example, if with a 6-inch Q.F. gun at a height of fifty feet standing on a racer path inclined 4′ forwards, the correction can be made from an observation at 4,000 yards, the errors going up the range are:—

Range.	Errors in range.
1,000	— 32 yards.
2,000	— 37 "
3,000	— 25 "
4,000	0 "

If the racer path is inclined backwards the errors would be practically the same in amount but +.

If the correction is made from an observation at 3,000 yards, the table on the previous page becomes :—

Range.	Errors in range.	Vertical error.
1,000	– 30 yards	– 2·9 feet
2,000	– 34 „	– 5 „
3,000	0 „	0 „
4,000	+ 38 „	+ 13·6 „

I need hardly point out that the above tables assume that firing proceeds on the line of training at which the correcting observation is made ; but my object is to show that the hypothetical defect on which Colonel Watkin dwells is not inherent in the principle of auto-sighting and that the amount of error introduced depends practically upon whether the gun is fired approximately on one line of training or whether that line varies through a wide angle. This error would, therefore, not prevent accurate practice either at a stationary target, or at a target moving in a tolerably direct line towards or away from the gun. The auto-sight is, in fact, not by any means so helpless as it has been made to appear. At the same time, the question of maintaining the verticality of the axis of the mounting is one that every auto-sight inventor must evidently face.

I cordially agree that the application of auto-sighting to "the older nature of guns and platforms" would be useless, and I have made no attempt to design a sight for these interesting memorials of a by-gone age. Since the days when the 9-in., 10-in., 11-in. and 12·5-in. R.M.L. guns were made, we and other Powers have moved far and fast. These guns in their day were excellent. That day has now passed and we have to meet new conditions. If our coast artillery is called upon to fight, its opponents will be armed with the best modern weapons whose speed of fire and accuracy is immensely superior to that of the short R.M.L. ordnance. Thus the 2nd class cruiser *Eclipse* steaming at sixteen knots on a course parallel to a straight coast line and passing 1,200 yards from a coast battery could, at peace practice, fire about :—

168 rounds	6-in.	Q.F.	inside	4,000	yards	range
242 „	4·7-in.	„	„	„	„	„
412 „	12-pr.	„	„	3,000	„	„

There is nothing in these figures to cause alarm. It would be easy with a single 6-in. Q.F. gun provided with an auto-sight to put forty shell into the *Eclipse* during the fourteen minutes she would be within 4,000 yards, when steaming at this speed and being hulled three times a minute, her chances of hitting a target eighteen square feet in area would be remote. But a battery of (say) four 9-in. R.M.L. guns and two 64-prs. worked by P.F. using Case III. would apparently be somewhat heavily handicapped in engaging such a vessel in free manœuvring waters.

The weapons which coast artillery can now call to its aid are the 6-pr., 12-pr., 4·7-in. and 6-in. Q.F. and the 9·2-in. and 10-in. B.L. I believe that the 9·2-in. B.L. of latest type with a muzzle velocity of 2,700 f.s. represents the *maximum* power necessary for the defence of our ports, and that a sacrifice of the immense advantage of speed of fire receives no adequate compensation in the employment of a heavier projectile. At the same time, I consider that the weapon *par excellence* of coast artillery is the 6-in. Q.F. gun with a muzzle velocity not less than 2,800 f.s., supplemented by the 12-pr. Q.F.* The slightest study of the recent bombardments of San Juan and Santiago, confirming all previous experience, serves to show how moderate are the requirements of coast defence. Quality of ordnance and training of men are the matters of real importance. Half a dozen 6-in. Q.F. guns capably handled would have more than sufficed for every requirement of Santiago attacked by a fleet containing five modern battleships. Whatever view may be adopted in regard to this larger question, it will, I think, be generally admitted that in discussing the advantages of auto-sighting, we must take into consideration modern ordnance rather than converted 64-prs. on blocked up platforms, or 9-in. R.M.L. on switch-back racers. How, therefore, do we stand as regards the mountings of what are entitled to rank as modern guns?

Existing H.P. mountings may be put aside as, except in cases of temporary aberration, their sites are too low for effective auto-sighting. For them the best method of laying at present available is evidently the straight edge foresight and V back sight employed with elevation indicator and D.R.F. or P.F. used as range-finder. Their present need is a non-recoiling carriage sight. All Q.F. guns, 3-pr. to 6-in., are free from the incubus of the "platform," to which Colonel Watkin refers, and all can be levelled without difficulty. The 6-in. B L., Mark I. and Vavasseur C.P. stand upon cast steel roller paths which admit of correction. The Mark I. and II. 9·2-in. and Mark III. 10-in. are not hopeful subjects for adjustment if their racer paths are out of level. I have described my recent designs,† and it will be noticed that in every case I have provided a solid cast iron pedestal with the special object of securing rigidity. These mountings can always be adjusted for level if settlement occurs after the pedestals have been fixed. In addition, it is possible to provide a simple mechanical arrangement, which corrects throughout 360° of training, for any ascertained deviation from the vertical. Summing up, therefore, Colonel Watkin's objection does not apply to any 3-pr., 6-pr., 12-pr., 4·7-in. and 6-in. Q.F. guns, or to any 6-in. B.L. and 9·2-in. B.L. or mountings of recent design. If, as I contend, it is the future and not the past that we must take into consideration, the application of auto-sighting is hampered by no restrictions.

It is pleasant to pass from the domain of theory into that of ascertained fact. Two of my auto-sights went straight from the R.C.D.

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* As a protection to confined interior waters against torpedo-boat raids, the 6-pr. Q.F. may suffice.

† "Proceedings" R.A. Institution, November, 1897.

shops to an out-station where they were fitted by the local artificers to two 4·7 mountings, not of R.C.D. design or manufacture. The roller paths were levelled, the sights adjusted, and a few rounds fired. On the following day, the trials began. The conditions throughout the practice were officially reported to be "the worst conceivable for laying, from bad light, mist and boisterous winds." At moderate ranges the target could not be seen with the unaided eye. The following are the results obtained in the rapid fire series using the telescope:—

A. Range 1167 Yards.

Round.	± yards.	*R* or *L* yards.
1	+ 25	5 *L*
2	+ 30	„
3	+ 25	„
4	+ 25	„
5	+ 30	„

Time 37·72 secs.

B. Range 1954 Yards.

Round.	± yards.	*R* or *L* yards.
1	+ 8	8 *L*
2	+ 10	„
3	+ 10	„
4	+ 13	„
5	+ 10	„

Time 41·96 secs.

C. Range 3,050 Yards.

1	+ 5	1 *R*
2	+ 5	1 *L*
3	+ 5	Line
4	Range	„
5	+ 10	1 *L*
6	+ 2	2 „
7	+ 2	1 „
8	+ 10	Line
9	+ 1	„
10	+ 2	„

Time 1 min. 42·6 secs.

D. Range 3775 Yards.

1	Range	Line
2	+ 1	„
3	+ 7	„
4	+ 15	„
5	+ 30	„
6	+ 30	„
7	+ 30	„
8	+ 80	„
9	+ 80	„
10	+ 10	„

Time not taken because layer's eye was tired.

During D series the target was scarcely visible with good glasses.

The ranges of the targets were taken with D.R.F. The fall of the shell was noted by range party on board a steamer.

A practical result of this kind outweighs much theory.

Coast artillery can now be provided with;—

9·2-in guns firing 1 round per minute.
6-in. „ „ 5 „ „ „
4·7-in. „ „ 7 „ „ „
12-pr. „ „ 10 „ „ „

If full value is to be obtained from these guns, auto-sighting is evidently essential. To apply to them "the present method of laying" is equivalent to putting a 15-stone jockey on a Derby winner. *Tempora mutantur, nos et mutamur in illis.* The auto-sight has come to stay.

AUTOMATIC SIGHTING.

— BY —

CAPTAIN H. S. JEUDWINE, R.A.

IN a paper by Colonel Watkin, published in the "Proceedings" for June, 1898, some possible disadvantages attending the use of automatic sighting were brought forward. I venture to think, however, that the arguments which I am about to submit in favour of the system are so strong as to counterbalance any objections which have hitherto been raised.

The practical advantages which, it may be claimed, are conferred by automatic sights of the service pattern are:—

I. Greatly increased rapidity of fire.

II. Increased accuracy of fire.

III. Diminished liability to disorganization of a command from hostile fire.

IV. The power of decentralization and its attendant benefits.

I.—Greatly increased rapidity of fire.

This hardly requires proof. It is very evidently the case with the lighter Q.F. guns used against torpedo-boat attack, where all pauses in fire to give out ranges, or to set sights, are avoided. It is sufficient to say that with the 12-pr. Q.F. with automatic sights, a rate of fire of twelve rounds a minute is attained, at a target going from eighteen to twenty miles an hour, and with most accurate results. I am told that in the Royal Navy eight aimed rounds a minute is the best that is expected from a 12-pr. Q.F. (of course with ordinary sights) at a moving target. It is improbable that the Garrison gunner could do better, with such training as he is likely to get. We may take it therefore that automatic sights will increase the rate of fire of these guns (the mainstay of torpedo-boat defence) by fifty per cent., without lessening their accuracy. This is an immense advantage in the case of targets which are likely to be under fire for an extremely short space of time. It may be mentioned that this advantage is practically independent of questions of range or site. Ranges will be short—probably not over 800 yards—and a height of twenty feet is sufficient.

In the case of the heavier B.L. guns the gain in rapidity of fire seems equally obvious. We are most of us pretty well acquainted with the ordinary delays which attend the gun group commander's "prediction." Added to this are delays in transmitting ranges, calling them out and putting them on the gun. With automatic sights these delays are impossible; the act of finding the range simultaneously lays the gun. Take the case of a 9·2-inch B.L. gun fitted with automatic sights, on a mounting such as the R.C.D. are now turning out—the gun recoiling in a cradle and returning to the firing position; capable of being easily and quickly laid for elevation or direction by one man, the layer, who can also fire the gun with his eye to the sights; quick, easy and powerful loading gear. Surely it is not too much to hope for two rounds a minute from such gear, with automatic sights; or even three, if arrangements could be made to load cartridge and shell simultaneously.

There is no necessity to consider automatic sighting in connection with R.M.L. guns, to which it is understood there is no intention of applying it. It is to be hoped that all these obsolete and useless weapons may soon cease to cumber the ground. Their removal will promote not only efficiency, but economy also.

II.—Increased accuracy of fire.

One of the objections urged to automatic-sighting is its possible inaccuracy as compared with the ordinary systems of range-finding and laying.

To deal first with its use in connection with the lighter Q.F. guns for defence against torpedo-boat attack. It has been clearly demonstrated by practice that for heights of twenty-five feet and upwards its accuracy up to 1,200 yards leaves nothing to be desired. No more is required of these guns.

Taking now the case of guns other than the above. Colonel Watkin has pointed out two objections, but they appear to have been met by improvements in manufacture, and should not now present any real drawbacks to accuracy.

The first is the personal error of the layer, with a sight not provided with a telescope, which Colonel Watkin estimates at two minutes. This disadvantage is now obviated by the addition of an excellent telescope to each set of sights, for use if required, and they are, therefore, in this particular, on the same level as any range-finder as regards accuracy, since a given error with the range-finder in observation, or with automatic sights in laying, would cause in each case the same deviation in the quadrant elevation of the gun.

The second objection urged is the difficulty of ensuring a level platform, owing to racers, etc., going out of level.

Since automatic sights are not to be applied to R.M.L. carriages there is no need to reckon with these wobbly antiquities. In the case of B.L. mountings, which, owing to their being constructed on sounder mechanical principles, are less likely to go out of level, a means of levelling will be provided.* On the second point therefore we find the automatic sight again on an equality with the range-finder.

There are in addition some reasons why automatic sights should give greater accuracy than any range-finder.

They are as follows :—

(1.) As there is a sight to each gun, each sight can be set, by means of the "error of the day" screw and adjusting foresight, to accommodate itself to any idiosyncracies of its own gun, or any peculiarities of its own layer. This can be done, with the help of trial shots, at any time before action.

(2.) There is only one personal error to affect the shooting—that of the layer—in place of two where a range-finder is used, those of the observer and gun captain (or layer) which may be cumulative.

(3.) That part of the gear of the service automatic sight which is essential to its accuracy as a range-finder is so extremely simple and strong, and works with such directness and absence of intervening parts, that there is apparently nothing which wear and tear can act on to produce error.

(4.) Automatic sights eliminate tidal errors. A range-finder can, of course, be corrected for height of tide, but there is still the quadrant elevation scale of the gun, which is graduated for mean tide, and must remain so. An error is, therefore, inevitable at all states of tide, excepting mean, decreasing with a higher site, increasing with a lower one, and only to be eliminated altogether by the clumsy method of making corrections in the range given by the range-finder. With automatic sights, on the other hand, tidal corrections are made, both as affecting the range-finding properties of the sight, and as affecting the quadrant elevation given to the gun, by the simple action of setting the tide lever.

(5.) Lastly, there must be added to the above the immunity, which is enjoyed when using automatic sights, from the mistakes of drum readers, dial numbers, gun group commanders, gun captains, or of the dials themselves. An inspection of any *accurately kept* practice report brings home to one pretty clearly what it means to get rid of all these possible sources of error.

III.—Diminished liability to disorganization of a command from hostile fire.

A range-finder (at all events inspection of our coast fortresses would make it seem so) must necessarily be so placed that no intelligent enemy could fail to detect it at once. The compliments his Q.F. and machine guns might be expected to pay it would probably soon disorganize it and its operators, with the result of disorganizing also a group and perhaps a whole battery command. Automatic sights on the other hand can be so shielded as to make them and their layers comparatively safe from machine and light Q.F. guns; and if one is damaged it is only one of the sights of one gun disorganized, and not a group or battery command.

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* See "Changes in war matériel," § 9380, February, 1899.

A consideration of the volume of fire which can be poured from the decks of even a single battle-ship or cruiser should make us unwilling to incur unnecessary exposure of men or *matériel,* and careful to ensure that disorganization shall not be easy, even in the event of severe losses to both.

IV.—The power of decentralization and its attendant benefits.

There can be no doubt that if we are to get the best value out of automatic sights our system of fire discipline with the heavier guns must be thoroughly remodelled, and this is anything but matter for regret.

Take the present conditions. Imagine a battery commander attempting to direct the fire of a command of three or four groups, possibly composed of guns of different natures and with quite distinct arcs of fire; served, perhaps, by a depression range-finder and two or more position-finders, the cells of the latter distant from him anything between 200 yards and two miles, with no direct communication to them except perhaps through an unreliable telephone situated occasionally at some distance from the B.C.'s post; unable, maybe, to see his groups or to communicate with his gun group commanders except by orderly.

The above is no fancy picture, and the spectacle is a sad one. It can be seen nearly every time that a battery command is manned completely and practised from as it would have to be in action. Its lessons are not brought home to us as clearly or as often as they might be, because this practice from an entire battery command under any approach to service conditions is of extremely rare occurrence, except when the command offers rather more than the usual facilities for fire direction.

Automatic sights, assuming, which does not seem over sanguine, the supply of cordite to all guns fitted with them, provide us with an exit from all these difficulties. Some such simple scheme of fire direction as the following would meet the case. The fire of each gun to be observed by its own layer, of each group by its own group commander, of each battery command by its battery commander. The layer to correct his fire as an ordinary rule, the group commander if he thinks necessary, the battery commander only in the event of erratic shooting which does not seem to be meeting with attention: he will probably be well advised not to interfere unless he deems it absolutely essential. The control of his groups is thus in no way taken out of the B.C.'s hands. He will still order them to commence or to cease fire; will select the part of the target to be attacked, and, where the F.C. does not do so, will select the target; will select the order of fire (though for the sake of effect it is natural to suppose that only the quickest rate of fire would be employed). The orders of fire might be considerably simplified, and those now in force for Q.F. guns seem applicable.

If necessary under this system more than one target might be engaged without difficulty by a battery command. This, although often very desirable on account of the different arcs of fire of groups, is at present only possible in the case of groups having separate position-finders. Great economy should also result. A large proportion of orderlies, dial numbers, telephone operators, range-finding observers, etc., would disappear and the number of expensive electrical communications would be largely reduced. Even fire commanders might occasionally be dispensed with, the senior battery commander, who would probably have leisure enough, at all events before action, performing his functions. To enable him to do this, however, his post must allow him a good view of the whole command and its approaches.

To sum up, automatic sighting seems to offer the one hope of a rational, economical, and efficient system of fire direction for coast artillery.

Rational, because it allows of division of responsibility and labour, and does not expect of one man performances which are beyond any one man's powers.

Economical, because its directness and simplicity allow of working with greatly decreased *personnel* and an absence of much of the costly *matériel* now installed; also because with the increased effect obtained from guns a smaller number will be required. (It is assumed that all R.M.L. guns are withdrawn; no amount of R.M.L. guns can by any possibility be considered equivalent to one 6-in. Q.F. gun, with a moderate command, fitted with automatic sights, when the disparity between the cost of stores, weight of metal, and number of men required to produce the same volume of fire is considered).

Efficient, because it allows more rapid and more accurate fire than any other system. It must be remembered, that what is required of Coast Artillery guns is, that they shall not only be hitters, but quick hitters. If it ever comes to real earnest with them, there will be a ship, perhaps several, trying to get to close quarters; if the ships get there, where the superiority in numbers of their light Q.F. and machine guns can tell, and the difference in accuracy between shore and ship is not so much felt, it means infinitely greater loss on shore, if not worse.

There was a time when cover and protection for shore guns appears to have been considered of first importance. This period produced those unwieldy monsters on disappearing and other mountings, which are good, under favourable conditions, for a round in every three or four minutes if they are in working order. The best protection from the enemy's fire is to hit him oftener and harder than he can hit us. We can do this even when greatly outmatched in number of guns (if we do not trust to obsolete and useless weapons) because we have generally command and always a fixed platform, and because while a very large proportion of his shells that hit our works do no damage at all, everyone of ours that hits him does probably a good deal. Guns that can be trusted to make an enemy's ship or ships sheer off, riddled and shattered—with luck, disabled or sinking—in the course of a few minutes, possess the best and the only true protection from fire, and such guns alone can perform the functions for which coast guns are intended.

For those who still doubt the wisdom of applying automatic sights at once to all our guns (mounted at suitable heights) which are worth it, it may be noted that the service automatic sights are convertible into ordinary tangent sights, by a turn of a lever, in a second or two. They are then available for use with range-finders for laying in the ordinary way if desired. I do not believe, however, that this lever will have much work thrown on it.

There is, of course, one class of guns—high angle fire guns—to which automatic sights are useless. To these the position-finder is a necessity.

QUICK FIRING FIELD EQUIPMENTS ON THE CONTINENT.

— BY —

CAPTAIN L. R. KENYON, R.A.

The following information as to Field Artillery Equipments on the Continent has been collected from various publications which have appeared during the last two years or so, the larger part of the information has been obtained from the *Revue d'Artillerie* which has published lengthy extracts from German official books, from other German publications, from the *Memorial de Artilleria* and from Swiss official or semi-official papers.

Assistance has also been obtained from the *Revue Militare Suisse, Journal of the United States Artillery, Journal of the Military Service Institution, U.S.A., Revue de l'Armée Belge* and *Revue du Cercle Militaire.*

GERMANY.

According to reports in the newspapers, the German army had at the end of 1898, been completely re-armed with the new so-called Q.F. gun, model 1896. The following details of this equipment are taken mainly from the published official books.*

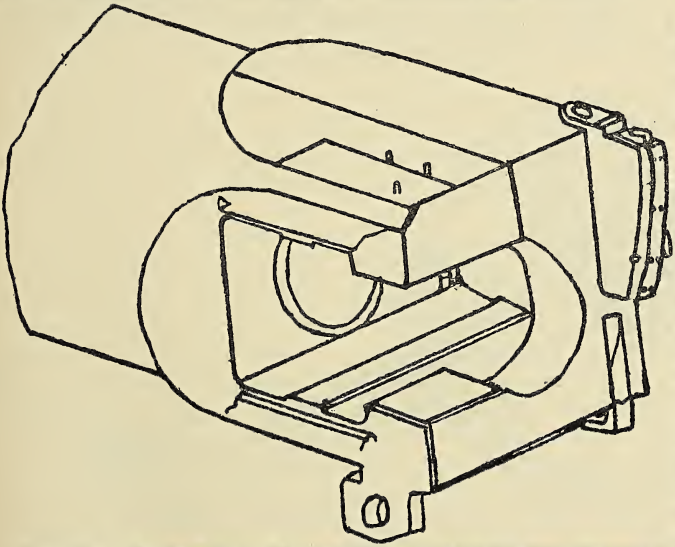

FIG. 1. Breech of German gun, showing Tangent Sight socket. Model 1896.

Gun.—The breech mechanism consists of a horizontal wedge, which opens to the right and contains the striker which is cocked automatically; in case of missfire it can be re-cocked without opening the breech. For firing, a lanyard with a handle or toggle attached to its other extremity is hooked on to a ring on the breech block and it remains hooked as long as the gun is in action; it is laid across the back of the axle seat when not actually being held by the firing number. There is a safety bolt by which the breech can be locked; and when the breech is so locked, the striker cannot fall. This bolt serves to keep the breech closed during travelling. On opening the breech, the fired cartridge is drawn back automatically, but it is not entirely ejected; it is removed by hand and thrown outside the left wheel. The opening at the breech end of the gun is cut away on the left hand side to facilitate loading. The calibre of the gun is 3·03 inches. The rifling has an increasing twist, the final twist being one turn in 25·6 calibres. There are thirty-two grooves. The gun is twenty-seven calibres long. The shot chamber is rifled and slopes off in rear into the powder chamber. The sight socket is at an angle, to compensate for drit. There is only one set of sights and that is on the right of the gun. The gun is made of nickel steel; instead of ordinary trunnions it has a vertical pivot underneath, which fits in a kind of cradle, which is connected to the carriage by trunnions; this allows of the gun being traversed in the carriage. The muzzle velocity is stated to be 1,525 f.s.,* and this agrees approximately with another statement made, namely that the highest point of the trajectory at a range of 2,187 yards is 118 feet. The new gun has a flatter trajectory than the old one and its maximum range is said to be 8,750 yards.

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* These books are the official drill book, published January, 1898 and Changes in the Handbook for Practice for Field Artillery for the Matériel Model, 1896". Some details of the equipment are given in these books, others can be deduced. Translations of considerable portions of them have appeared in the *Revue d'Artillerie*, April–June, 1898; these portions include the system of fire discipline in force. Further information has also been collated from the *Revue d'Artillerie, Revue Militaire Suisse, Revue du Cercle Militaire*, &c. The former of these publications has at intervals since 1896 given particulars with drawings, of the Q.F. Field Equipments which have been designed by private firms. The sketches of the German Equipment are from a pamphlet on "Field Artillery Matériel, model 1896," by Captain Zuelnger; published Berlin, 1899. They are reproduced in *Revue d'Artillerie*, January, 1899.

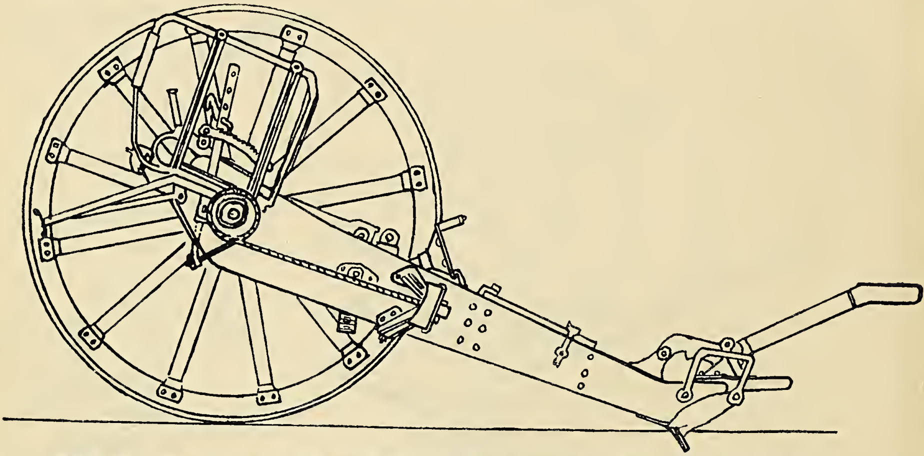

Fig 2. German Field Gun Carriage. Model 1896.

Carriage.—This is a rigid one, *i.e.* there is no hydraulic or other buffer, the recoil is checked by means of (1) a rope brake on the Lemoine principle; (2) a folding spade. The rope brake is similar to that on the old German equipment and also to that used by the French. It consists of a rope twisted round the inner flanges of the naves and connected to a cross shaft which carries brake blocks on its extremities. It can be used as a travelling or firing brake. As in the old pattern carriage (model 73–88) this brake is put in action by means of a lever by the side of the left axle seat.

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* *Militar Zeitung*, 10.12.'98.

The spade folds up on to the top of the trail (see Fig. 2); to put it in action, the trail must be lifted, and the spade can then be folded down and fastened by a chain. The drill book lays down "that the spade is only to be used when specially ordered by the battery commander, the section commander, or the gun captain." It is to be used for rapid fire or when on ground which, though slippery, affords a good hold to the spade, or when on a reverse slope and when the rope brake proves insufficient. The spade, when used, strains the carriage much more than the rope brake. When the wheels are not on the same level and when the spade is used, the carriage, owing to its "lift" or jump on firing tends to jump towards the side of the lower wheel and thus gets off the target*; the wheels are also unequally tried; it is laid down, therefore, that a hole should be dug under the higher wheel so as to get both wheels on the same level if possible. The elevating gear is of the double screw pattern. The carriage is fitted with a top carriage and with traversing gear, which is worked by a hand wheel. The strains on the different parts of the carriage are considerably affected if the axis of the gun on firing does not coincide with the centre line of the trail, especially when the spade is in action; for this reason, it is directed that the traversing gear should not, if it can be helped, be used when the spade is down, or, at any rate, extreme traverse should not be used.† A good deal of stress is laid on not using the traversing gear more than can be helped. There is considerable lift of the front part of the carriage when the spade is being used, especially if the latter is in good holding ground.

The height of the axis of the gun is 37·4 inches; in the old equipment it was 45·3 inches; this reduction has been effected by altering the diameter of the wheels from 55·1 inches to 47·25 inches. The gunners are warned lest the muzzle should strike the ground when they are limbering up. Axle-tree seats are provided for Field Batteries, but not for Horse Batteries. There is a handle on the cap square for the gunner to hold on to. Two drag ropes are attached to the front of the carriage brackets for use in running the gun up, when necessary; when not required they are folded up against the brackets. There is a trail box for small stores and it also forms a seat for the layer. Judging from the figure, the breast of the carriage would be only 17·7 inches from ground when limbered up.

The weight of the carriage is said to be 6 cwt. 69 lbs., but this sounds too light, especially as it is also said that the gun and carriage together weigh 17 cwt. 76 lbs.

Sights.—The Tangent sight is graduated up to 5,468 yards, and it remains in the gun on firing. It has a level or clinometer attached to it, which can be used for indirect laying. The sight has a rack cut on it and it is run up or down by means of a pinion; this can, however, be put out of gear if it is desired to make a considerable alteration in the elevation rapidly. The sight bar is a curved one.*

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* This, of course, is the case with any gun which has a spade under the point of the trail.

† When the spade is down, is the time when, it would seem, that the traversing gear was particularly wanted, as free movement of the end of the trail is then impossible.

Hitherto "sight plates" have been used with German field guns; they could be fitted on to the bar of the Tangent sight, as required, so as to make the reading on the sight bar appear to be the same as the reading found necessary for the fuze (the fuzes are graduated in metres); thus one order was sufficient for range and fuze. These plates are now done away with and a moveable sleeve or socket is provided to perform the same functions.

The *Richtfläche* is retained; this is an apparatus which fits on the breech of the gun and is used for obtaining the line in indirect laying. It fits on to the small pins which can be seen sticking up from the breech of the gun (see Fig. 1).

Ammunition.—The charge is contained in a brass cartridge case; the projectile is not fixed to this case. Two natures of projectile are used, viz., shrapnel shell and high explosive shell; they are both four calibres long and have one driving band only. They are of the same weight, 15 lbs. The shrapnel contains 300 bullets which weigh 45 to the pound; it has a base burster of black powder and the bullets are

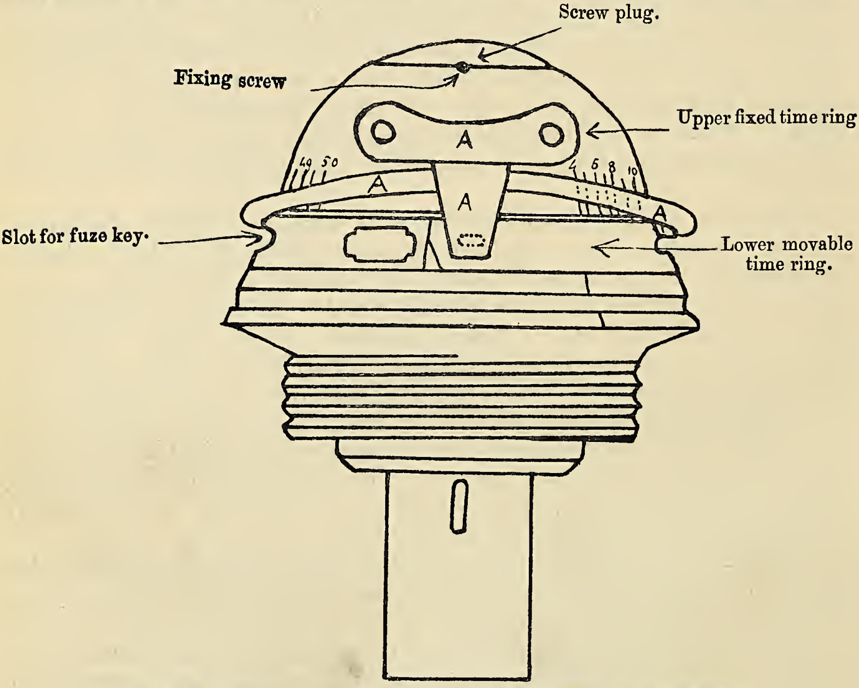

Fig. 3. Double action fuze. Model 1896.

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* A description, with drawings, of a sight, which seems to be very similar to the German one, and which was invented by Capt. Korrodi, of the Swiss Artillery and Secretary of the Swiss Experimental Committee is given in *Rivista di Artiglieria e Genio*, December, 1898, and in *Revue d' Artillerie*, February, 1899.

packed in a smoke making composition. The body of the shell is of steel; on the bursting charge acting, the head is blown off and the bullets are driven out.[*] Case shot is not used; *percussion* shrapnel is used instead up to the range of 328 yards.

The only fuze used is a double action one (see Fig. 3) graduated at 50 metre intervals from 400 metres to 5,000 metres (5,468 yards). The figures 4, 6, 8, etc., on the fuze represent 400, 600, 800, etc., metres. Beyond this range, high explosive shell with percussion fuze should be used. The safety pin (A A in Fig. 3) is withdrawn from the fuze before the fuze is set; it can be replaced if the fuze is not used. The fuzes are carried complete in the shell in the limbers and wagons, and, when there, are set on the "bridge" *i.e.*, so that the time arrangement cannot act. No loosening or tightening of any clamping arrangement in order to set them is necessary. A key is used merely to turn the time ring.

The ammunition is packed in the limbers and wagons in baskets, which have a lid closed by a strap. Each basket contains four projectiles and four cartridges. The ammunition is brought up to the gun in these baskets. The lid of the limber box is at the back and it folds down so as to form a shelf. Thirty-six rounds are carried in each limber.

The weight of charge used is 1·28 lbs; the explosive used is said to be in the form of sticks and to resemble cordite in appearance. It is said to be less violent than the explosive formerly used.

No details are given as to the high explosive shell. The following remarks on the high explosive shell used with the late equipment are, however, of interest. The gun (Model 73–91) of this equipment was introduced in place of the previous gun, which it resembled exactly in outline, by being made of stronger material so that it might not be burst by the explosion in the bore of one of the shells. It is now said that no such explosion has, as a matter of fact, occurred, but it is not said how much practice is carried out with these shells. The shells were made of steel with thick walls, and they weighed 16½ lbs. and had a bursting charge of 0·37 lbs. It appears that they were chiefly intended for use as time shell for searching out men behind cover rather than for destroying buildings, etc., for which their very small bursting charges would not make them very efficient. The angle of opening was 110°, but there was a dead angle of 90° in front of the point of burst. The shell was said to burst into 500 fragments. It seems that the Germans claimed that by the use of this shell they avoided the necessity of the introduction of a field howitzer, which they considered objectionable on account of the increased complication of a field army which it entailed.[†] The angle of descent of the splinters of this shell being much greater than that of the bullets of a shrapnel shell, it had much greater searching effect against troops behind cover; it was burst in the air by means of a time fuze, so that the splinters might strike down on the enemy. It used the same fuze (double action) as the shrapnel shell. The explosive, believed to be picric acid, was enclosed in a cardboard cylinder and was dropped into the shell through the fuze hole, which was a large one.

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[*] In the late equipment, the shell weighed 16½ lb.; the calibre was 3·46 inches; length of shell 2½ calibres, with two driving bands; twist of rifling, uniform, one turn in fifty calibres. The shrapnel had a central burster.

[†] *Revue d'Artillerie*, June, 1896. Papers by Major Tiedemann, Posen Field Artillery; by Captain Prehn, formerly proof officer at Krupp's works, and by General Rohne; translated in Journal U.S. Artillery, May-August, 1898.

In the new drill-book it is stated that under certain circumstances the heavy artillery of an army may be added to the artillery of an army corps and the detail is given of such a heavy battery. It consists of six 5·9-in. howitzers, ten ammunition wagons, six platform wagons, forge, etc. It is said that the howitzers cannot be fired for any length of time except on a platform.

In a speech of the War Minister in the German Parliament on introducing the Army Estimates, reported in the *Times* of 12th January, 1899, it is stated "that Field Howitzer Batteries are to be formed and money has been taken for this purpose."

General notes on the new equipment.—The weight of the equipment is stated variously to be 32 cwt. 76 lbs., or 33 cwt. 51 lbs. without gunners in each case.* The horse artillery equipment is said to weigh about 1 cwt. less than the field, so possibly the one weight applies to the field, the other to the horse artillery gun. Axle seats are provided for the former, but not for the latter, this appears to be the only difference between the two.

Thirty-six rounds are carried in each limber; there are six guns and nine ammunition wagons in each battery, two wagons carrying high explosive (Granate) shell. By this means, 1008 rounds are carried in the battery or 168 rounds per gun (i.e. thirty-six in each limber, and fifty-two in each wagon body). On the battery going into action, three wagons accompany the guns and are placed eight metres in rear of the right guns of sections. The wagon bodies are either detached from the limbers or the teams are unhooked. In the former case, the ammunition baskets are withdrawn from the wagon limbers, and these then join the gun limbers. To facilitate the supply of ammunition from the wagon bodies after the limbers have been withdrawn, the wagon bodies are provided with two prop sticks.

The detachment consists of a gun captain (who supervises generally) and five men. To save them from being deafened by continuous firing, it is laid down that they should be allowed to put cotton wool in their ears, and a supply of this is carried in the limbers. The officer commanding the battery may, if he thinks fit, allow the men to kneel down when that does not interfere with their working the gun. When opportunity offers, the empty cartridge cases should be replaced in the baskets which are then fastened up and put back in the limber or wagon.

As the layer has also to ram the shell home with the rammer, it is obvious that laying is interfered with by loading. The layer does not fire, but the number who opens and closes the breech does that. In the case of rapid fire, the gun captain has to assist in working the gun, and the gun is fired by his order; it is not run up unless necessary. The maximum rate of fire permitted is thirty rounds per battery a minute; for ordinary fire, four rounds per battery a minute is laid down.

When seen at manœuvres, the equipment is said to have appeared to be very light and mobile; the gun was obviously lower than in the old equipment.

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* The weight of the old field artillery equipment was 39 cwt. 32 lbs. (without gunners). The only difference between it and the old horse artillery equipment was that the latter had no axletree seats.

From a consideration of all that has been said above, about this new German field gun, it can be scarcely considered to deserve the title "Quick Firing." The most marked improvement certainly seems to be in its mobility, compared with the old equipment. About 6 cwt. has been saved, and the limber carries six rounds and the wagon body seven rounds more than formerly.* The only sacrifice made has been a reduction of weight of shell from 16½ lbs. to 15 lbs. and a reduction of the diameter of the wheels by nearly 8 inches. This sacrifice of height of wheels is somewhat serious, as the pull on the traces varies, approximately, inversely as the diameter of the wheels, when passing over obstacles. With this equipment also, the Germans without introducing any very radical changes, have endeavoured to facilitate the service of the gun by (1) an improved breech mechanism with percussion firing, (2) brass cartridge case, (3) spade, (4) ammunition baskets, (5) sight combined with clinometer, which need not be removed for firing, and has a rack and pinion instead of a clamping screw, (6) a lanyard permanently hooked as long as the gun is in action.

It is interesting to note that the new Drill Book makes the following comparisons between infantry and artillery fire. Infantry fire, well directed, against troops in close order in the open or against artillery has considerable effect even at ranges between 1640 and 1093 yards. Troops cannot remain in close order at 3280 yards from unshaken hostile artillery. The superiority of artillery fire over infantry fire begins to decrease at ranges under 1093 yards; at about 656 yards, infantry fire is generally considered the most effective. At ranges under 1093 yards, the combat between infantry and artillery demands great rapidity of decision.

FRANCE.

The French have up to now succeeded in keeping the new equipment, which they are known to be providing, very secret, and very little seems to have been published about it. They are believed to have begun trying Q.F. field guns some five years ago. It is, however, stated that now every Army Corps has some of the new guns. They have been issued in four gun batteries; this appears to be a tentative measure and one which has many opponents; in fact it is said to be disapproved of in very high places. These guns were seen at autumn manœuvres in 1898 both near Cambrai and Chalons.† The gun is said to have a calibre of 2·95 inches ‡; it is made of nickel steel and has the usual (de Bange) breech mechanism, the gun is connected to the carriage by means of a recoil cylinder which allows it to recoil on the carriage. Rough laying is done by using the hand-spike, line laying by traversing gear fitted on the carriage. To keep the carriage from recoiling, a strong spade is secured to the rear end of the trail. The gun is laid and fired by a man sitting at the side of the carriage. Splinter proof shields are provided on each side of the gun. There are seats also, on which, *it is said*, men sit when the gun is being fired. Rapidity of fire depends on the gun being automatically returned to its original position; on the use of fixed ammunition (the shell and cartridge are said to be like a large rifle cartridge of an immoderate size); and on the possibility of simultaneous laying and loading. Ordinarily, it is said that the gun can fire five rounds a minute, but that with special arrangements for the supply of ammunition twenty rounds a minute can be fired. High explosive shell and shrapnel are used; the latter contains 250 balls. It is said that in rapid fire a lateral motion (presumably by the traversing gear) is given to the gun so as to make it distribute its fire and "faucher le terrain." The gun is reported to appear to be very low on its wheels, the carriage is very long, and the space between gun and limber wheels is greater than formerly (of course a long trail and low wheels diminish the tendency of the carriage to lift on firing; the Germans have made their wheels eight inches less than in the old equipment—see ante). The new matériel appeared to be very mobile. At the Cambrai manœuvres of the 1st Army Corps, it is said that the wagons were placed close up to the guns when in action so that there was no running backwards and forwards of men for ammunition.

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* Old Equipment: limber thirty rounds; wagon body forty-five rounds
New Equipment: limber thirty-six rounds; wagon body fifty-two rounds.

† *Revue Militaire Suisse*, October, 1898; *Journal Military Service Institution*, November, 1889.

‡ The old pattern Field and Horse Artillery guns had calibres of 3·54 inches and 3·15 inches and fired shell of 19 lbs. and 14 lbs. weight, respectively.

It is said that the expense of rearming the field and horse artillery is to be met by dismantling part of the old enceinte of Paris. This dismantling does not appear to have been yet done.

AUSTRIA.

The trials of Q.F. field guns in this country are stated to have been started in 1894 when two guns, one of bronze-steel and the other of steel, were tried. Their calibres were 3·14 and 3·54 inches respectively; weights of shell 10 lbs. and 13½ lbs.; they used metal cartridge cases and breech mechanisms of the falling block type. The results of these trials are said to have been satisfactory and high rates of fire attained. It would seem, however, that these equipments could not have been all that could be wished as further trials have since been undertaken and attempts have also been made to improve the existing guns (model 1875) and carriages. These attempts have led to a conversion of the present equipment which, of course, does not preclude a complete rearmament, if found necessary eventually, but it gives time for further trials to be carried out and the experience of other countries may be made use of.

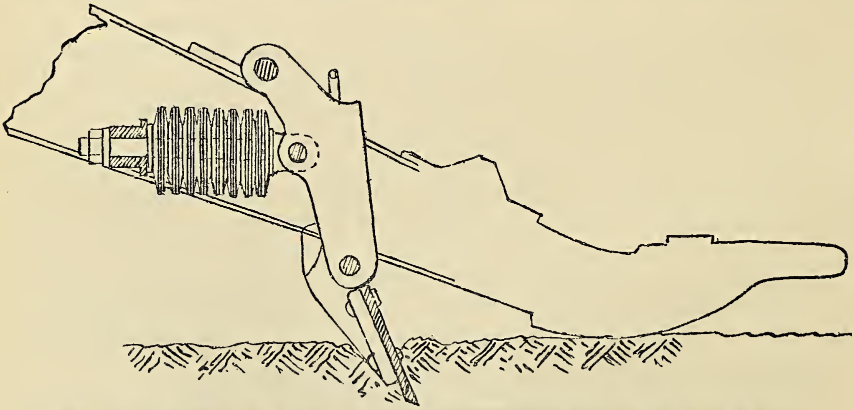

Fig. 4. (i) Spade used in conversion of Austrian Field Artillery Gun Carriage, before firing.

The alterations effected have been described in an official document* and are as follows :—(1.) A cover to the (radial) vent, to prevent the tube being inserted till the breech is closed; (2.) adoption of a spade attached to the trail, *see Fig. 4*; (3.) an arrangement for automatically drawing the safety pin from the fuze on removing the shell from the limber; (4) abolition of case shot; (5) adoption of a fuze setter for setting the fuze automatically; other minor alterations have also been made such as slight changes of the obturator, shrapnel shell, &c.

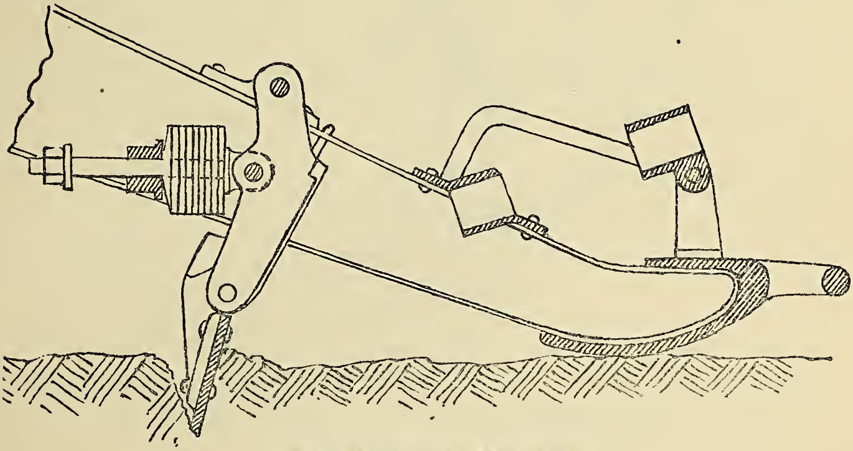

Fig. 4. (ii) On Firing.

By these improvements, a rate of fire of four to six rounds a minute is said to be attained. The necessity of the vent cover or guard is obvious when a high rate of fire is desired from a gun provided with a radial vent. Without it, the firing number might insert the tube and fire at any moment, whether the breech block was closed or not.

The sketches show the way in which the spade works. On firing, the gun and carriage recoil from thirty to forty inches, and the springs attached to the spade bring the carriage back to within about eight inches of its former position. The weight added by this arrangement is 48 lbs. The cost of it is said to be 60 francs. It is not intended that this apparatus should always be used, but only when the tactical situation demands a rapid fire.

With regard to the abolition of case shot, it may be noted that this step has been taken by the Germans too. The new Austrian shrapnel weighs 14·75 lbs. (calibre of gun 3·42 inches) number of balls 250 (35 to the pound.). A double-action fuze is used with it. By some arrangement, on withdrawing the shell from the limber, the safety pin is automatically removed; it is not clear how this is done. Instead of case shot, shrapnel with fuze set so as to act a few yards from the gun is used, and its effect up to 437 yards is said to be better than that of case shot.

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* A précis of this is given in *Revue d'Artillerie,* July, 1898.

The fuze setter is an instrument with graduations on it corresponding to the graduations on a fuze. When it has once been set, it can be rapidly applied to any number of fuzes and brings them to the same graduation as itself.

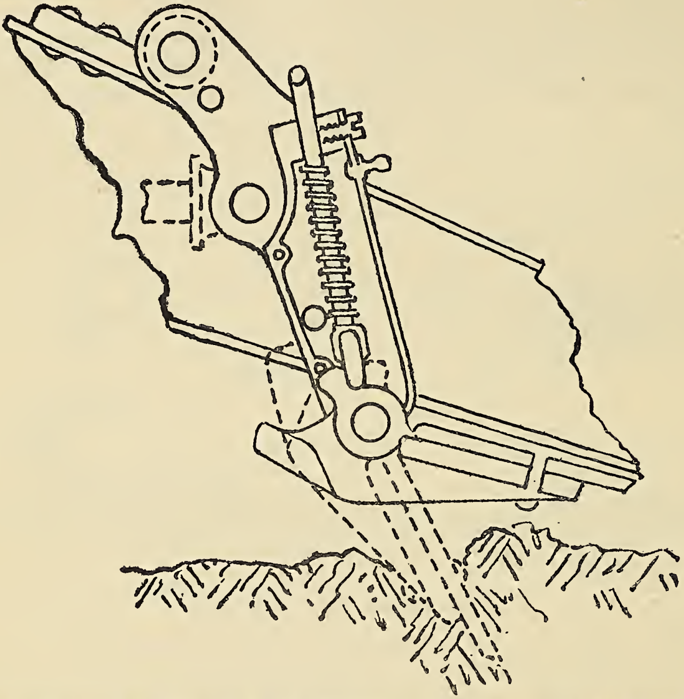

Fig. 4. (iii) Showing apparatus for putting spade in gear or out of gear.

The obturator of the old (1875) gun has been altered to enable it to fire smokeless powder. A metallic cartridge case is not used.

Although the Austrians have thus made considerable improvements in their old matériel, they have continued their experiments with new equipments.* In the first half of 1898, four gun equipments were under trial. Their calibres varied from 2·95 to 3·07 inches. The guns were of bronze with an inner tube of steel. Two guns had hydraulic buffers; one had a chain arrangement, and the fourth had no buffer attached to it. The breech mechanisms were either of the wedge type, opening to the left, or of the Nordenfelt type.† Both mechanisms had safety arrangements to guard against premature firing, and included a percussion arrangement which was automatically cocked on closing the breech.

The carriages allowed of a certain amount of traverse and had travelling brakes. The carriage with the gun which had no buffer had also a firing brake. A spade which could be folded back, was, it seems, attached to the trail in each case. It was made of steel and was fastened to a bolt with springs and india-rubber interposed. On firing the springs were compressed about eight inches, and then, expanding, they ran the carriage up again. The hydraulic buffers allowed of a movement of the gun through about twenty inches.

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* *Revue Militaire Suisse*, May, 1898.

† Presumably this means the Maxim-Nordenfelt type, as the Nordenfelt mechanism, as used in the service 3-prs., does not appear to have been applied to Q.F. Field guns by either the Maxim-Nordenfelt Company or by the Nordenfelt Company of Paris.

A brass cartridge (not attached to the shell) was used with these guns, and a charge of 1·1 lbs. with the 3·07 inch guns gave to the 13·2 lb. shell a muzzle velocity of 1,800 f.s. The shrapnel contained 280 balls (35 to the pound). No case shot were supplied. A rate of fire of five rounds a minute was realized.

It is said that a battery of eight of these guns would have twelve ammunition wagons, nine carrying shrapnel, three high explosive shell. A double-action fuze is used with both shell, graduated up to 4,900 yards.

In the latter half of 1898, further trials are reported* to have been carried out with a Maxim-Nordenfelt equipment, similiar to that tried in Spain in 1897. It is said to have been thought favourably of but that it required certain improvements before it came up to the Austrian requirements.

TURKEY.

Turkey is said to be about to order 1,000 Q.F. field guns in Germany at a price of 10,000 francs each. The contract is ready and they are only awaiting an Iradé from the Sultan directing that it shall be signed.

SPAIN.†

In August, 1896, the Director General of Spanish Artillery requested the Experimental Committee at Madrid to consider the question of rearming their field artillery.‡ Two officers were, therefore, deputed to visit the principal foreign factories. On their return, they presented their report in which they went carefully into the whole question of field artillery armament; they considered the weight behind the team should be 35½-cwt. (without gunners) : that the shrapnel shell should weigh 13·2 lbs., with bullets forty-one to the pound; that the calibre should be 2·75 inches; M.V. 1,640 to 1,960 f.s. They pointed out that rapidity of fire depended upon (1) checking recoil (2) rapidity of loading (3) rapidity of laying. Rapidity of loading could be best obtained by using fixed ammunition and single motion breech mechanism. To keep up a rapid fire it was necessary that 4 or 5 rounds shall be brought up to the gun at a time. For horse artillery, the axletree seats and travelling brake should be removed, and this would bring the weight down to 33½-cwt. which would allow of sufficient mobility. They recommended that the following equipments should be obtained for trial

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* *Revue d'Artillerie*, December, 1898.

† Information obtained from *Memorial d'Artilleria*, November, 1896; *Revue d'Artillerie* May, 1897 and March, 1898.

‡ The most modern gun at this time in the Spanish Field Artillery seems to have been of a 1880 model; calibre 3·15 inches; projectile 14-lbs.; weight behind teams, about 30-cwt. without gunners.

(1) Krupp's (2) Maxim-Nordenfelt (3) St. Chamond.* Of these, the Krupp gun had the simplest carriage, but it was the least powerful gun of the three. The St. Chamond gun was the most powerful but the mechanism was the most complicated. The Maxim-Nordenfelt gun was intermediate, as regards power, between the other two and it had a good breech mechanism.

The Experimental Committee practically adopted the report of these two officers, except that they said some mountain guns (Krupp) of 2·95 inches calibre had recently been purchased for use in Cuba and for the sake of uniformity they considered the new field gun should have the same calibre. The shell should weigh 14·3 lbs. They considered absolute suppression of recoil was hopeless though it was the most essential point in rapid fire. It should, however, be reduced to a minimum so that the amount of re-laying necessary should be small. It was not useful to exaggerate rapidity of fire; five to six rounds a minute would be sufficient, and that, they understood, was Krupp's opinion also. The simplest method, before the Committee, of checking recoil was Krupp's; it consisted of a trail spade connected to the trail by a hinge and spring. Other methods consisted of the use of buffers which were adapted either to the entire carriage or to the gun alone. They recommended the adoption of fixed ammunition, though they recognized that the metal case was one-tenth the weight of the projectile. They considered the Maxim-Nordenfelt breech mechanism† a very good one and likely to answer their purposes. They recommended that, in addition to the equipments already referred to, a new field equipment designed by Colonel Sotomayor should be tried.

This stage seems to have been reached in October, 1896.

By August, 1897, trials had been carried out at the Carabanchel ranges of four guns in comparison with a 3·09 inch Sotomayor gun of model 1891.‡

These four guns were two from Krupp (light and heavy), one from St. Chamond (heavy), one Maxim-Nordenfelt. They were all of 2·95 inches calibre. The Sotomayor carriage had no spade or brake; these other four carriages had trail spades; the Krupp carriages had Bellville springs, the other two firms supplied carriages with hydraulic buffers. All the guns used metallic cartridges and smokeless powder; loading and laying could go on simultaneously; the ammunition was brought up in boxes; the guns could be traversed through 8° altogether on the carriage. After a preliminary firing trial these four experimental equipments and the Sotomayor gun were put through a three months travelling and manœuvring trial over different sorts of ground. Further firing trials were then gone through.

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* From drawings and pictures of the St. Chamond and Vickers equipments which have appeared in the *Engineer*, *Journal R.U.S.I.*, *Revue d'Artillerie*, *Journal of the United States Artillery*, it is evident that this St. Chamond carriage (Darmancier patent) is very similar to that of Messrs. Vickers, Sons and Maxim.

† This mechanism would probably be the same as that of the Maxim-Nordenfelt guns recently used in the Soudan, at the Atbara and at Omdurman.

‡ This gun though made and tried some years ago never seems to have been adopted into the Spanish service.

The following table gives a few particulars as to these guns.

	Krupp.		Saint Chamond.	Maxim-Nordenfelt.	Sotomayor.
	Heavy.	Light.			
Weight of gun, cwt.	7·84	6.1	8·4	6·1	6·9
Weight of gun and carriage, cwt.	19·7	16	20	18·6	16
Weight of projectile, lbs	14·2	12.9	14·2	13·2	16
Number of bullets in Shrapnel ...	250	200	300	110[†]	231
Number of bullets to the lb. ...	41	41	?[*]	?	35
Weight behind team, cwt. ...	34·8	31·5	35·2	32·2	32·2
Muzzle Velocity, f.s.	1640	1640	1968	1574	1672

No decision appears to have been come to, and the Committee were awaiting the delivery of the new Sotomayor 2·95 inch Q.F. field gun; an order for this gun has been given to the Trubia arsenal and delivery promised in 1897.

It is not improbable that the expenses of the late American war have put a stop to the re-armament by Spain of her field artillery.

ITALY.[‡]

The bulk of the Italian Field Artillery is at present armed with a 3·42 inch gun firing a 15·3 lb. shell. The equipment is considered generally to be too heavy. There are also a number of batteries armed with a 2·9 inch gun, firing a 9·4 lb. shell. This gun is considered not to be powerful enough and it is believed to be the intention of the Government in case of re-arming the field artillery, to deal first with this gun.

In 1897, the Italian Government arranged for trials of Q.F. field guns. Equipments were supplied by Krupp, Armstrong and Maxim-Nordenfelt and by the arsenals of Naples, Turin and Helvetica. The trials were concluded at the Nettuno ranges by February, 1898. The results were, however, not conclusive and the guns did not fulfil the conditions laid down; recoil and jump (or to speak strictly, "lift" of the carriage) were not overcome. Further trials appeared to be necessary.

In a report presented to the Italian Parliament, it was stated that it was necessary to replace the 2·9 inch, (9·4 pr.) guns but that the 3·42 inch (15·3 pr.) guns could, for the present at any rate, be retained, provided certain modifications were made to them.

In the above mentioned trials, the gun which was thought to give most satisfaction was a 3·07 inch gun made at Turin, and the most satisfactory carriage was one used with a 3·11 inch gun, designed by Colonel Ducros. This carriage was stated to be remarkable for its firing brake; it was said to combine the principle[§] of the Engelhardt axle and an axle spade devised by an Italian officer.

Meanwhile trials with converted 3·42 inch equipments had been going on with a view to obtaining an increased rapidity of fire; modified breech and firing mechanisms were tried. The carriage was modified by having a spade attached to it; shoe brakes were also tried and were thought well of as they strained the carriage less than a spade. It is thought that a rate of fire of from four to five rounds a minute may be attained with this equipment when modified. These trials with converted equipments were carried out in March, 1898.

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[*] If this shell has forty-five per cent. of its weight in bullets (which is a good percentage) its bullets must be about forty-seven to the pound.

[†] This shell breaks into 230 pieces (including the bullets); it is probably like the French shell in which the bullets are packed in iron segments.

[‡] Principally from *Revue Militare Suisse*, various numbers, 1898.

[§] An arrangement of india-rubber pads.

BELGIUM

The question of Q.F. field guns is said to be under consideration now in Belgium, * where a preference for a calibre of 2·95 inches exists. It is proposed to carry out trials with equipments provided by the following firms :—Cockerill (in connection with the Paris Nordenfelt Company) St. Chamond, Creusot, (Schneider-Canet,) Chatillon & Commentry, Cail, (Bange et Piffard) and Skoda de Pilsen. Some trials are believed to have been carried out at the end of 1898 with some of these equipments.

RUSSIA.

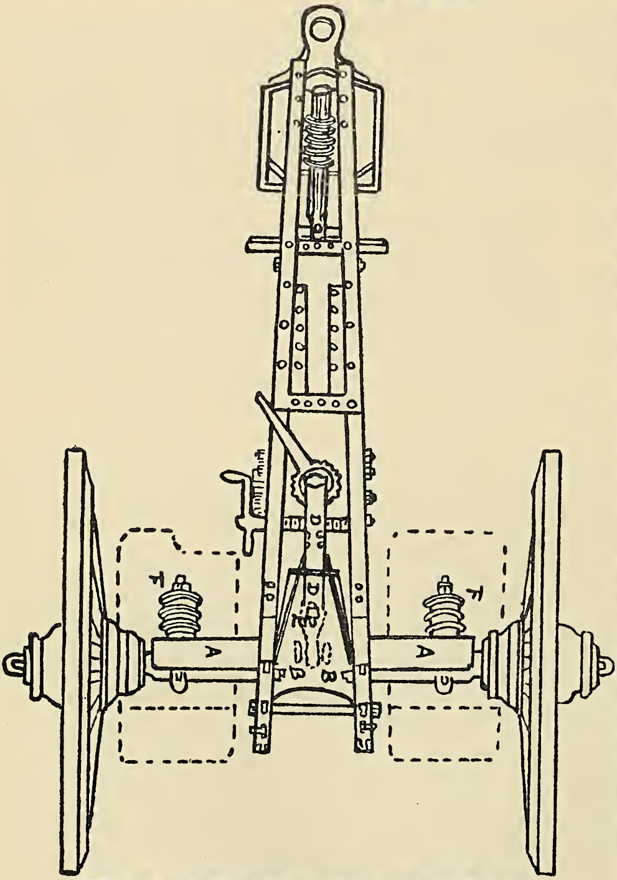

Fig. 5. Russian gun carriage. Model 1895

In 1895, the Russians introduced a new carriage for their light field and horse artillery batteries. Simultaneous laying and loading were allowed for. In 1897, a hand-book, written by a Russian Colonel, was published at Moscow giving certain information as to this carriage, with sketches.† The carriage has a spade pivoted near the end of the trail and connected by a rod with a system of india-rubber pads in the point of the trail. It is said that after the second round the only motion of the carriage on firing, is a lifting one, and that the wheels fall in the same place each time.

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* *Revue Militaire Suisse*, October 1898,

† *Revue d'Artillerie*, Nov. 1897.

By an ingenious arrangement, the whole of the brackets of the carriage can be caused to slide laterally over the axle. Over the axle is an angle iron A (Figs. 5 and 6), and the brackets can slide to a certain extent laterally on this; they are moved by means of the lever D which pivots at E and which is actuated by a handle outside the right bracket of the carriage. The front end of the lever can thus be forced against either of the two studs BB on the angle iron piece A, and the carriage brackets are thus traversed. The brackets are prevented from sliding to the rear on the piece A by means of a projection G; the shock of discharge is thus passed from the carriage brackets to the angle iron A, and thence through an arrangement of india-rubber pads F F to the axletree. It is believed that General Engelhardt is the originator of this use of india-rubber pads for lessening the initial blow on the axletree. It may be noted that, according to the figures, tensile stays are not provided.

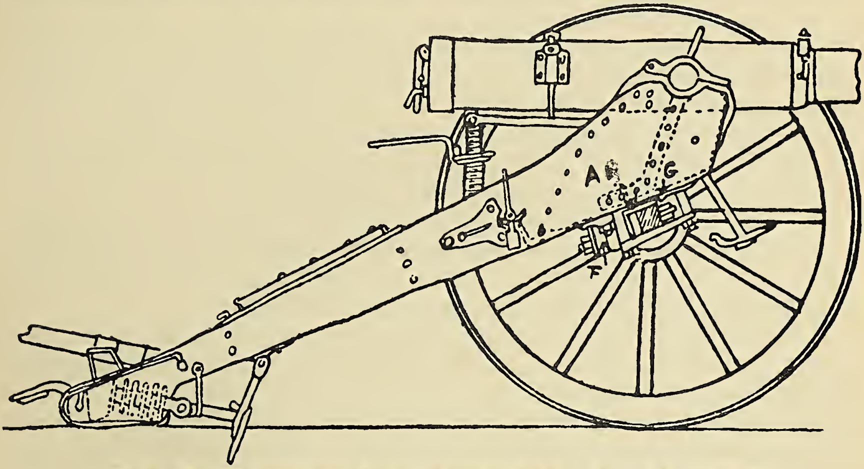

Fig. 6. Russian gun carriage. Model 1895.

The gun is sighted on the right, and the breech opens to the left. Its calibre is 3·42 inches and the shell weighs 15·2 lbs. and has a M.V. of 1,355 f.s. The weight of this (light) equipment is 32 cwt., 3 qrs., 3 lbs.

A rate of fire of four to five rounds a minute is said to be obtained with this equipment.

It is believed that trials of Q.F. equipments were carried out in 1898, but great secrecy has been observed, and no accounts of any trials appear to have been published.

SWITZERLAND.

The present field gun has a calibre of 3·31 inches, and fires a shell weighing 14·77 lbs.; it is a breech-loader on the Krupp principle, and dates from 1881. Its weight behind the team without gunners is about 39½ cwt.

In 1892 the Federal Government asked different firms for a new design of equipment, but no action seems to have been taken with regard to any designs which were submitted.

In 1895, Colonel Schumacher, Chief of the Swiss Artillery, published a "Sketch of a field equipment for the Swiss Artillery" in which he discussed at length the requirements which he considered should be fulfilled,* with a view to its acting as a guide to manufacturing firms, to show them what sort of equipment was wanted in Switzerland. The following is a brief summary of his paper:—The calibre of the gun should be 2·95 inches, final twist of rifling 1 in 30, the weight of projectile 12·8 lbs. He considers a shrapnel of this weight might hold 263 bullets, 41 to the lb.,† this shell should have a base burster. The weight of the gun and carriage should be 11 cwt. 24 lbs., and the limber should be the same, giving a weight behind the team of 22 cwt. 48 lbs. and four gunners would be carried in addition. This weight would be drawn by four horses. He considers about 200 rounds per gun should be carried, and this would be nearly done by carrying forty-eight rounds in each limber, and in each wagon body; if nine wagons per six gun battery were provided, as he recommends, this would give 192 rounds a gun. The ammunition should be carried in the limber in boxes containing four rounds each.

He considers the M.V. should be 1640 f.s. As to breech mechanism he does not express any decided preference for any particular mechanism, although he says that if a metallic case is not adopted he considers the interrupted screw system is the best.

A high explosive shell should be adopted, using a simple "double safety" percussion fuze. For the shrapnel shell, a double action fuze with a time ring which will burn for a considerable time should be used, it should be permanently clamped down and not require unclamping and clamping to enable it to be set. He considers the Swiss smokeless powder meets requirements; it appears to consist of nitrocellulose, gelatinized and compressed and cut into squares. Nobel powder (? ballistite) he states wears out the bore of the gun very quickly, and it would be no advantage to use it instead of the service powder. Colonel Schumacher does not pronounce definitely in favour of a brass cartridge case or against it, but says that if an interrupted breech screw mechanism is adopted he considers a brass case unnecessary. He states that slowness of fire is not usually attributable to the loading; it is in rapid laying that an increase in the rate of fire must be looked for, and it should be possible to lay and load simultaneously. Suppression of recoil is very desirable but it does not yet appear to have been obtained. He considers a shield weighing about 154 lbs. should be carried, (this is to be included in the weights of gun and carriage given above). Track of wheels should be 54 inches, weight of each wheel 132 lbs. diameter from 51 to 53 inches. The axis of the trunnions should be from 35 to 39 inches above the ground.

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* A detailed *résumé* of this sketch is given in *Revue d'Artillerie* Sept.–Dec. 1896.

† Col. Schumacher states that this is the weight of the (then) German bullets, and that the Russian shrapnel bullets are 42·6 to a pound.

It will be noticed that Colonel Schumacher gives the manufacturer no easy task, as he requires a high velocity with a 12·8 lb. shell and only allows 11 cwt. 24 lbs. weight for the gun and carriage. The shrapnel shell also, to fulfil his requirements, must have 50 per cent of its weight in bullets; 41 per cent is about the highest for any existing shrapnel of about this weight with a base burster.

His paper is however very interesting, and he gives descriptions of various Q.F. field equipments which have come under his observation, though he does not offer an opinion as to their merits; it is not clear that he had actually seen them tried.

In 1897, the Bureau of Federal Artillery published a list giving full details, weights, ballistics etc., of some twenty-one Q.F. field equipments, designs of which had presumably been obtained from the various firms.

At the end of May and beginning of June 1898, trials of four different equipments were carried out at Thoun. These equipments were provided by Creusot, (Canet); Cockerill, (Nordenfelt, Paris); Krupp and St. Chamond. The first equipment was withdrawn early in the proceedings. The Cockerill, (Nordenfelt) carriage had a hydraulic buffer, wheel brakes and a trail spade. The Krupp gun had the wedge breech mechanism; the carriage had a large spade connected to it by springs, and like most of Krupp's field carriages of which any account has been published, no hydraulic buffer.* The St. Chamond carriage appears to have been of the type usually provided by that firm, namely, with a long buffer under the trail carrying a spade at its extremity. The trials appear to have been exhaustive, but no details have been published of the results. In addition to the firing trials, the equipments were put through a travelling test of some 400 kilometres. It appears that Colonel Schumacher's views as to the desiderata of a new field gun have not been adopted *in toto* by the experimental committee as their requirements are now said to be as follows† :—weight behind team 33 cwt. 51 lbs. with at least thirty-two rounds, weight of shell 13·9 lbs. to 14·4 lbs. M.V. 1640 f.s. After the above trials, it was decided to purchase a complete Krupp battery with ammunition and wagons. It is also intended to continue trials of a carriage made in Switzerland and of the Cockerill-Nordenfelt gun. New powders are also being tried. ‡

The present state of the field artillery armaments of continental powers appears to be as follows:—the Germans have completed their re-armament, and the French are pushing theirs on as fast as possible. Russia and Austria have introduced improvements into their existing equipments so as to increase their rate of fire; Italy proposes to do the same for her field artillery; and these three nations as well as

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* A description with sketch of a trail spade with spiral springs, patented by Krupp in England is given, in *Engineering* 15th April, 1898, and in *Revue d'Artillerie*, May, 1898. For other carriages tried by Krupp see *Revue d' Artillerie*, February, 1899.

† *Revue de l'Armée Belge*, May-June 1898.

‡ *Revue d'Artillerie*, November, 1898.

Spain, Belgium and Switzerland are carrying out trials with new designs of equipments. *

A good deal of interest, not to say excitement, was caused when a short time ago it was announced that the Germans and French were actually rearming their field artillery with a Q.F. gun. It appears to be more than doubtful as to how far any of the field equipments, of whose trials anything is known, are entitled to be called quick firers in the sense that that term has been hitherto employed. We know now pretty well what the German gun is like; about the French gun a good many wild statements have been made and rates of fire up to twenty-five rounds a minute have been claimed for it; most people will however require some substantial proof before accepting all that is claimed for this gun.†

Full details have long been published‡ as to many field guns which have been designed for rapid fire by private firms in England or on the continent. Great ingenuity has been exhibited in their designs and many novel expedients have been introduced with a view to checking recoil and facilitating loading and laying. Rates of fire of ten to fifteen rounds a minute are claimed, and yet we find that none of these guns, though many of them have been tried, have produced any such wonderful results as to induce any Power to instantly adopt them; the introduction of a brass cartridge case and a spade under the trail do not in themselves make a gun a quick-firer, and it would seem that we are as yet a long way from obtaining the ideal gun and carriage which should be such that the gun after firing should return to the same position as it was in before firing. In fact it seems extremely doubtful if such equipment can be made. The adoption by Germany and certain other Powers of brass cartridge cases is probably largely due to difficulties which have been experienced with the Krupp breech mechanism when using smokeless powders.

But now that universal attention has been turned to increasing the rapidity of fire, it will no doubt be found possible to improve breech mechanisms, firing arrangements, sights, fuzes and ammunition supply and also to reduce the recoil. The Germans appear to have made great improvements in all these respects.

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* The United States are also reported to be carrying out similar trials. The Transvaal purchased some Schneider Q.F. field guns in 1896; Brazil, Uruguay, Mexico and Japan are all stated to be trying various equipments.

† Twelve rounds a minute is about the most that can be got out of the 12-pr. Q.F. gun of 12 cwt. when mounted in a permanent work.

‡ *Revue d' Artillerie,* 1896-7-8.

CANNON AT CRESSY.

— BY —

LIEUT.-COLONEL H. W. L. HIME, *late* R.A.

It has been often asserted, and as often denied, that we brought two or three small guns, or bombards, into the field at the battle of Cressy. Were the evidence as evenly balanced now as when Gibbon pronounced an opinion upon it, it would be a waste of time to restate it; but since new matter has been brought to light by MM. Rigollot, Cayrol, Polain and Kervyn de Lettenhove, it is time to reconsider the whole question.

It is admitted on all sides, I believe, that guns were used at sieges before the year 1346. "In the year 1338 we come upon unquestionable testimony that cannon, both of iron and brass, were employed at that date on board English ships of war."[*] It is certain that Edward the Third, brought gunners with him on his second expedition against France:—"Ingyners LVII., artellers VI., gonners VI."[†] It is equally certain that, long before his expedition, the King had been collecting materials for the manufacture of gun-powder. Entries of payments for these materials are found in the Wardrobe Accounts on dates ranging from 25th December, 1344, to 18th October, 1347. One extract will suffice here. Payment was made for 912 lbs. of saltpetre and 886 lbs. of sulphur on the "10th May of the said 20th year of his reign."[‡] The 10th May of the 20th year of Edward the Third's reign was 10th May, 1346: Cressy was fought on the 26th Aug. of the same year. Finally the King must have taken guns with him on this expedition; for he had "to our knowledge twenty guns" at the siege of Calais which immediately followed the battle of Cressy[§]. These facts do not, of course, prove that we had guns at Cressy; but they show that we *might have* had them. They remove any antecedent improbability, which might otherwise exist, of the use of guns at that battle. To ascertain whether guns were actually used there or not, we must fall back on the earliest accounts of the battle.

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[*] "Ancient Cannon in Europe," by Lieut. (now General Sir H.) Brackenbury, in "Proceedings" R.A. Institution, Woolwich, Vol. IV. He quotes "Roll T.G. 11,097."

[†] Ibid. He quotes "Harleian MS. 782, fol. 63."

[‡] Rev. Jos. Hunter, F.S.A., in "Archæology for 1847"; XXXII., 381.

[§] "Ancient Cannon, etc."

A fourteenth century MS., "Les Grandes Chroniques de St. Denis," tells us that at Cressy the English used three guns, — "getterent trois canons"; and the writer hints that it may have been owing to their fire that the Genoese crossbowmen gave way.* This suggestion is certainly baseless. Whether we had guns, or whether we had not, the Genoese were put to flight and the battle was won by the English archers.

From the "Istorie Pistolesi" an anonymous chronicle said (with apparent truth) to have been written about the same time as the chronicles of John Villani, i.e., before 1348, it would appear that when the crisis of Cressy arrived, "the English knights, taking with them the Black Prince, a body of wild Welch ('uomini salvatichi') and many bombards, advanced to attack the French army."† The phrase "many bombards' is, no doubt, a gross exaggeration; but we must make allowance for the writer's lively Italian imagination.

Giovanni Villani, the Italian chronicler, was a banker by profession. He travelled much in the ordinary transaction of his business, and he doubtless obtained what bankers have always contrived to obtain, the very best available information about foreign affairs. "The English guns at Cressy," says this trustworthy writer, "made a noise like thunder and caused much loss in men and horses."‡ "Gibbon has thrown out a sort of objection" to the use of guns at Cressy, says Hallam, "on account of Froissart's silence. But the positive testimony of Villani, who died within two years afterwards, and had manifestly obtained much information as to the great events passing in France, cannot be rejected."§ It must not be supposed that Villani's account of our guns at Cressy is confined to a stray allusion such as the sentence above quoted. Throughout his narrative of the battle he consistently connects the effects produced by the archers and the gunners. He had previously said that "the guns shot forth iron bullets by means of fire, to terrify and destroy the horses of the French"; || and he afterwards mentions that "the Genoese archers were continually being hit by the archers and gunners."¶ He adds that "the whole plain was covered by men struck down by arrows and cannon-ball."** It is difficult to believe that these repeated allusions to our guns were due to the mendacity of Villani or of his informants. Yet the evidence of Villani has been looked upon with more or less

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* Quoted in "Ancient Cannon, etc.," as "Brit. Mus. MS., Cotton, Nero, E. II., part 2, fol. 397." The writer of the chronicles also hints at treason :—"si ne scet ou si ce fust par trahyson, mais Dieu le sceut." I quote M. Rigollot's version, with its curious Arabic termination, – 'but God knows best': *w'allâhu a'alam.*

† Prato, 1835; p. 459.

‡ "Istorie Fiorentini," in "Classici Ital," Milan, 1803; VIII., 173.

§ "Middle Ages"; I., 478.

|| As above; p. 171.

¶ Ibid., p. 174.

** Ibid., p. 176. The word used by Villani is 'pallotole,' which evidently corresponds with the 'pellets' of Chaucer and the 'pilles' of Rabelais.

suspicion since Gibbon said :—"the authority of John Villani must be weighed against the silence of Froissart."* Was Froissart silent ?

Froissart tells us that his "Chronicles" (from 1326 to 1356) are founded upon the "Chronicles of Messire Jehan le Bel," Canon of St. Lambert's, Liège, supplemented by all the oral evidence he could collect from eye witnesses of the events he records. About 1838–9 a French antiquary, Dr. Rigollot, discovered many and serious discrepancies between the MSS. from which Froissart's Chronicles have been printed and a very fine MS. in the Library of Amiens, which had never been published. The Amiens' MS adheres much more closely to le Bel than the others, and it is much fuller. On this discovery being made, the question at once arose :—Is the Amiens MS. a late MS., in which interpolations were made ; or is it an early MS., passages of which were suppressed in later MSS ?

Long and patient study led Dr. Rigollot to the conclusion, first, that the Amiens MS. (which he transcribed with his own hand) is the earliest and best we possess ; and secondly, that although written long after Froissart's second visit to England in 1361, it was written before the period (about 1390) when English influences gained the ascendant in his mind.† Shortly afterwards another *savant*, M. de Cayrol, investigated the matter, and he came to the same conclusion :—" (le MS. d'Amiens) est celui qui offre le texte le plus authentique du premier livre des Chroniques de Froissart."‡ Many years afterwards a Belgian man of letters, M. Polain, studied the question, and he too came to precisely the same conclusion :—" (le MS. d'Amiens est) " à mon avis l'un des plus précieux que l'on ait de Froissart. C'st incontestbalement la plus ancienne réduction connue de cet écrivain." § As to the discrepancies, they all three agree in the opinion (which few who give any attention to the matter will dispute) that after yielding to English influences, Froissart re-edited his Chronicles, suppressing everything that might offend the English Court and, in some cases, even altering the narrative.‖ M. Kervyn de Lettenhove endorses generally the opinions of his three precursors, and strengthens and illustrates their arguments with great ability and immense learning in his edition of Froissart's works, Brussels, 1870. The Valenciennes MS., which he dates at 1376, " n'est guerre que l'ébauche de la première réduction ;"** the Amiens MS., which he dates at 1377–9, is " le texte qui forme réellement la première réduction."†† We are perfectly justified, then, in accepting the conclusion that the historical value of the Amiens MS. is much greater than that of the later MSS. from which the ordinary editions of the Chronicles have been printed.

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* Decline and Fall of the Roman Empire " ; VIII., 75.

† " Mém. sur le MS. de Froissart de la Bibliothèque de la ville d'Amiens," published in the " Mém. de la Société des Antiquaires de Picardie," 1840 ; III, 133 ff

‡ " Lettre addressé à M. Rigollot sur le MS. des Chroniques de Froissart ; " ibid., p. 185 ff. The battle of Cressy is described in the 1st Book of the Chronicles.

§ Preface to Polain's edition of Jehan le Bel, XXII.

¶ Ibid. II, 85, *note*.

** " Œuvres de Froissart," vol. I, part 2, p. 34.

†† Ibid. p. 35.

In the original account of the battle of Cressy given in the Amiens MS. (which will be found in the Appendix of Polain's edition of "Les Vrayes Chroniques de Messire Jehan le Bel," Brussels, 1863, and in Lettenhove's edition of Froissart) occurs the following passage:—"lors (les Genevois) prissent leur arbalestres et leur artillerie et s'appareillièrent pour commenchier le bataille . . . Quant li maistres des arbalestriers eut ordonné et aroutté les Genevois pour traire, ils commenchièrent à huer et à juper moult haut, et li Engles tout koy et descliquièrent aucuns kanons qu'ils avoient en le bataille, pour esbahir les Genevois,"—'then the Genoese took their crossbows and apparatus and prepared for the fight . . . And when their officers had got them into shooting-formation, they raised a great shouting. But the English (kept) quite quiet, and loosed off[*] some guns they had with them, to frighten the Genoese.' That this reference to cannon was no random phrase, written in haste and erased at leisure, is shown by the fact that in the "Abridgement of the Chronicles" made by Froissart himself some years afterwards,[†] he repeats the assertion in slightly different words:—("li Engles firent) descliquier deux ou trois bonbardiaulx."[‡] So far from being silent about our guns, then, Froissart mentions them in two of his best MSS. distinctly and rationally; neither exaggerating their number like the "Istorie Pistolesi," nor exaggerating their effect like the "Grandes Chroniques de St. Denis" and Villani. These, however, are among the suppressed passages: they are not to be found in any of the latter MSS.

It may, perhaps, be suggested that Froissart suppressed these passages, because he found on further enquiry, that they were erroneous. Those who offer such a suggestion are bound to make it good; and this may be no easy matter, for it is extremely improbable. The narrative of Froissart (as he tells us,) is based upon that of Jehan le Bel, supplemented by the evidence of eye witnesses. Now le Bel does not mention the guns at Cressy. The inference is, therefore, that Froissart got his information about them from those who fought there, and who could make no possible mistake about so unusual an event. So sound, in fact, did he consider his information that when he afterwards abridged (the first Book of) his Chronicles, he retained the statement about the guns. To ask us to believe that after this he discovered his informants were mistaken and their statements untrue, makes too great a demand upon our credulity. Froissart supressed these and many other passages just about the time when a prepossession in favour of England and the English took hold of him, and we cannot reasonably doubt that this bias was the common cause of their suppression. But in what possible way, it may be asked, could the statement about the guns have been offensive to the English Court? Could anything have been more offensive to the Court, or to the country, than to hint that the victory at Cressy was not wholly and absolutely due to the courage and prowess of the King and the Prince of Wales, the knights and the archers; to insinuate that we owed our success, in the very smallest degree, to pernicious machines,[*] which were universally regarded as cowardly and devilish contrivances,[†] destructive alike to valour and honour and the whole institution of Chivalry?

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[*] "*I lowse*, as a gonner lowseth a pece of ordonaunce; *Je declique*." J. Palsgrave's "Lesclarcissement de la langue Francoyse;" 1530.

[†] "Abrégè, dont l'authenticité nous semble incontestable." Lettenhove's "Froissart;" v. I, pt. 2, p. 149.

[‡] MS. in Bib. Nat., Paris, No. 10,144; quoted ibid., p. 153.

Those who had hoped to find this question treated with his usual ability and finally settled by Mr. C. W. C. Oman in his "History of the Art of War," have been disappointed. Although the matter relates to the most important epoch in the whole history of war,—the first appearance of fire-arms on the battle field,—he consigns it to a foot-note [‡] and makes no allusion to either the "Istorie Pistolesi" or the plain statements of Froissart. With the "Chronicles of St. Denis" and Villani Mr. Oman deals summarily. "We need not," he says, "pay much heed to the statement of Villani and the Grandes Chroniques de France that the English had two or three small cannon in their front line, which scared the Genoese and horses." Are not horses scared by Artillery fire now? If the Genoese were scared by new engines of destruction at Cressy, were not French soldiers scared by new projectiles,—English rockets,—at Leipsig and Waterloo? It is not clear why we are to pay less heed to Villani and the Chronicles about our guns than about any other matter. Edward left England with gunners and ammunition, and sat down before Calais a few weeks afterwards with twenty cannon.[§] Why are we to pay little heed to credible witnesses who assure us he used his guns in the interval? "It is most unlikely," continues Mr. Oman, "that cannon could have been brought across France with a field army." If it be most unlikely that we could bring two or three bombards across such a country as Northern France in Aug. 1346, it is simply incredible that Napoleon could drag guns many times their weight across the Alps in May, 1800. Yet we know he did it. The difficulty of transporting two or three *pots de fer*, weighing probably less than 50 lbs. each,[||] would not seem to be insuperable. Finally remarks Mr. Oman, "no English Chronicle mentions them." Does Mr. Oman seriously intend us to infer that the writers of these Chronicles had never heard of the guns, because they do not happen to mention them? He himself has not mentioned the "Istorie Pistolesi" and "Froissart" in connection with the question. Are we to infer from his silence that he never heard of these works? The Chronicles referred to were written, in almost all cases, by monks immured in English monasteries, and their silence is but a straw in the balance when weighed against the clear and positive evidence of two perfectly independent writers of so high a rank as Villani and Froissart, supported by two writers of a lower rank, the authors of the "Grandes Chroniques de St. Denis" and the "Istorie Pistolesi." That we used guns at Cressy is just as certain as that the Black Prince won his spurs there.

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[*] "In generis humani perniciem"; Melancthon.

[†] "Diabolici strumenti"; Muratori.

[‡] I, 611.

[§] According to the author of a ballad written at the time, the effect of the guns at the siege of Calais was not all that could have been desired:—

"Gonners to schew their arte,
Into the town in many a parte,
Schot many a fulle great stone.
Thanked be God and Mary mild,
They hurt neither man, woman nor child;
To the houses, though, they did harm."

Wright and Halliwell's "*Reliquiæ Antiquæ*" London, 1841.

[||] "Ancient Cannon etc."

THE SHOOTING OF OUR COAST ARTILLERY AND HOW TO IMPROVE IT.

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BY

MAJOR-GENERAL J. F. OWEN, R.A.

1. Progress made in recent years.

THOUGH heavily handicapped by much obsolete material, by having in so many cases to fire from obsolete guns and from works which were designed on far other bases than such as would, in these days, be admitted as sound, there is no branch of the service in which more progress has been made, in shooting with the weapons given to it, than our Coast Artillery.

It is not proposed, in this short paper, to touch upon the question of material, save where unavoidable, nor upon the tactical working of Coast Artillery which is necessarily so closely bound up with the guns and material supplied.

When we consider that ten years ago it was not possible to employ aimed fire from heavy guns at a ship, unless at rest or moving so slowly as to be almost in the same condition, (excepting in the very rare cases in which the Watkin position finder existed with trained men to work it), and that, at the present moment, we are able to direct an effective and well aimed fire upon vessels going at any known rate of speed, with perfect ease, and that at ranges of two to three miles, it will be seen how very great the advance has been.

2. Want of rapidity of fire.

But, there is always that horrid "But," much, very much, more requires to be done; though we can deliver a well aimed fire from heavy guns and that at long ranges, and almost irrespective of the rate of speed of our target, yet we fail, as yet, woefully in rapidity of fire; however much we may, in some cases, be kept back by old type guns and matériel we can and must be up and doing, and attain that comparative rapidity of fire which the matériel will allow of, and which certainly is something very much beyond what we have so far attained to; the object of this paper is mainly to point out some means, at least, towards that end.

In a most valuable paper recently published.* Major-General J. B. Richardson, R.A., G.O.C. R.A., Gibraltar has ably treated of the necessity for more rapid firing and touched upon many of the points where difficulties are met with.

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* R.A.I. "Proceedings," Vol. XXIV., No. 3, 1897.

While laying special stress upon the absolute necessity for this increased rapidity, it is not intended, in any way, to assert that we have reached the degree of accuracy which we ought to obtain, this is certainly not the case as yet, nor should any pains be spared to improve that accuracy.

When a defect is perceived and it is wished to make it good, evidently the first proceeding should be to diagnose it, to discover the causes which have led to the defect and then to establish a procedure which will nullify or counteract them.

In this particular case the diagnosis is simple enough for an Artillerist, at all behind the scenes, but to exhibit all the causes in detail to one's readers, would be beyond the scope of this paper.

Here it may briefly be said that amongst the principal causes which have led to the question of rapidity of fire from our Coast Artillery having been, until lately, comparatively neglected, are :—

That the means necessary to enable our Coast Artillery to deliver aimed fire against rapidily moving targets, viz., instruments, adjuncts, etc.,—have only been supplied, except to a few places, within the last few years and that the tactical system established for best utilizing them for the desired end, i.e. accurate fire at rapidly moving targets,—has but recently been thoroughly imbibed by the whole of the officers and men,—if indeed we can accurately say that it is "thoroughly" imbibed even now.

Until very recently therefore we have, with the means but gradually placed at our disposal, been working up to an accuracy of fire at moving targets which has now been reached with so fair a measure of success that there are few, if any, of our coast works from which such can not be delivered, up even to the farthest ranges.

Seeing that, as before stated, there were, ten years ago, practically no works for which this could be said, progress so far has been fairly satisfactory.

3. Change of probable conditions of naval attack.

Then the conditions of Naval attack, as supposed probable, against a coast work, have been revolutionized in the last few years.

When our first system of service practice from coast works and the mode of prize firing to encourage advance in the same, were introduced, in 1891—(indentical with those now existing, save for minor modifications and, as to the latter, a slight introduction of the element "time") what did we picture as the probable form of attack of coast works by a Naval force?

It was that of ships steaming slowing,—say at three or four knots,—opposite the work, and delivering a slow, deliberate and not very accurate fire, from a comparatively small number of heavy guns.

Against such an attack, though rapidity of course was valuable, the factor "accuracy," which by means of the instruments and adjuncts being supplied to coast works should then have been very much superior to that of the ship's fire, assumed the greatest importance.

But what a change, since then, has come over the picture we should draw! Since 1891, the speed of men-of-war, the number of their guns, the rapidity and accuracy of their fire, and the weight of metal they can throw, have increased enormously, far, far beyond our hesitating advances in coast armament and the supply of the instruments, improvements and adjuncts required to make them, even as they are, fairly effective.

This was only natural and what we should expect; for the first line, our Navy, must have first the advantage of modern improvements.

Now therefore in 1898 we draw a very different picture of a possible Naval attack upon a coast work; instead of the leisurely promenade above described, we see a squadron suddenly appear on the far horizon, moving rapidly towards the work or works to be attacked, so rapidly, that from the time each ship comes within our effective range, to the moment that it is within 1,000 yards of our works, but some fifteen or twenty minutes elapse.

In that short period of time we must effect what damage we can, for so overwhelming would be their fire at short range and so complete its accuracy, that to save useless loss of men, the garrison of the work must, as a rule, from that moment, be simply placed under cover.

This picture, of course, may be looked upon as overdrawn but, in any case, conditions have changed so completely that it stands out in the most patent manner, that "rapidity" of fire must be taken into very serious consideration and all possible means be taken by the Coast Artillery to increase it as much as possible.

4. GREAT INCREASE IN POWER OF COAST DEFENCES GAINED BY INCREASE IN RAPIDITY OF FIRE.

If from any given battery—say of four guns,—we can so increase the rapidity of fire as to double the number of "hits per gun per minute," obtained against a ship, in a given time, it is practically as though, with the slow rate now existing, we built a new four gun work to supplement the first work. This would be a very costly operation in itself (and would moreover necessitate a large increase of personnel for manning the additional guns), while if a double rapidity of "hits per gun per minute" can be obtained by improved organization and training and by the supply of a few more required adjuncts or the improvements of existing ones, with the armament as it is, the cost would be but a trifle.

The very great importance therefore of doing all in our power to increase rapidity is most palpable, from every point of view, especially the financial point.

As an example, we will take a four gun battery, having four 6″ B.L. guns on H.P. mountings.

The best results obtained we will say by a company, firing in each case for about ten minutes, at a record target, were:—

a. Competitive practice, 1897–8, figure of merit, "hits per gun per minute," ....0·263.

b. Competitive practice, new system, 1898–9, figure of merit, "hits per gun per minute,".....................0·516.

The offensive power of this battery shooting as was done at practice *b*, was evidently nearly double that obtained with such shooting as shown in *a*.

If we take the hits on a ships target as about double those gained on the "record target,"—as they certainly would be, if not more than that, and then consider that one-half, at least, of the shot striking a ship may, on an average, be taken as effective rounds, we should obtain, in firing, say for ten minutes, at an enemy's ship :—

For *a*, about twenty-one effective hits.
For *b*, „ forty-one „ „

The value of the battery's fire being thus immensely increased. To gain such an increase, and that without any addition to the number of guns or to the personnel employed, is worth taking much trouble and the overcoming of many difficulties.

5. COMPETITIVE PRIZE FIRING—EXISTING SYSTEM.

In order to stimulate the personnel to obtain excellence in the direction considered, at the time, to be that of the most importance, prizes of some description, are at present, and have for a long time past, been given in the several arms, to encourage good shooting.

In the Coast Artillery, up to the year 1891, such prizes were purely individual prizes for shooting, then practically dependent upon the individual Nos. 1 who laid each gun both for direction and range.

By 1891, however it had come to be recognized that the good shooting of a battery or company depended on the combined knowledge of their work and of their skill in it of the officers, N.C.O.'s and men, as a whole, each in their own particular portion of it, and that consequently some different method of prize rewarding should be established.

A Committee, of which I myself was President, was therefore appointed to draw up such a system for the different branches of the Artillery.

The system proposed by them was adopted and officially promulgated, and is that at present in use, with certain small modifications, as explained further on.

The system consists briefly :—

(A). Of rewarding excellence in shooting (and partially in fire discipline), by a *classification of the batteries or companies*, according to the standard reached by each, as "qualified" for "first," "second," or "third" class prize, as the case might be; and in giving to the best shooting battery or company of a certain number grouped together (if qualified), a prize, in the shape of a badge, to be worn for a year, by every N.C.O. and man.*

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* To each group of companies is allotted a given number of prizes according to the number of the companies in the group, e.g., for a group of from four to seven companies, two prizes, in such a group, therefore two companies would win prizes, but only two, even though others might "qualify;" the prizes being, as already mentioned, a badge to be worn by each N.C.O. and man of the company. This badge being first, second, or third class, according to the standard of classification reached by the winning company, but only one company in each group is allowed to wear a first class badge.

This mode of reward has been found, on the whole, to work very well and to give, by the ardent emulation it causes, an ample stimulus towards the end required. Nor does there seem to be any necessity just at present to alter it.

The results of the shooting, in each year, as shown by the classification of companies and the prizes won, are published in the Royal Artillery local and general regimental orders, and are looked for with great interest by all.

(The idea itself originated with the writer, and a similar mode of stimulating the rifle shooting of the South Australian paid Militia had been founded by him in that Colony when he was their Commandant in 1885–8, *see* Appendix IV., to this paper).

(B). Certain individual prizes are also given under it, viz.:—

Gun-layers prizes, for these specialists.

Gunnery prizes, for a certain number of N.C.O.'s and men who pass the best examinations, practical and theoretical in gunnery. But we need not discuss these individual prizes at present, even though changes may perhaps be advisable in them, as, so far, they have not been awarded for the results of actual gun practice.

6. MODE OF ARRIVING AT CLASSIFICATION OF COMPANIES.

The settling of the nature of the company prizes, and the classification for and distribution of the prizes was one thing. But to determine how the classification was to be arrived at, was quite another and more important matter.

Without going into unnecessary details, the mode laid down by the Committee, accepted by the authorities and which has been carried out since 1891, in the different branches of the regiment was as follows:—

The necessary classification to be made and the prizes to be won, by "competitive prize firing," in which, as far as possible, each company, as a whole, is tested.

Certain credits also being given, towards the total which could be made, for "drill series," and for what is designated as the "fire discipline" of the company, during the manning and carrying on of the practice.

The main and principal factor however, for the gaining of credits, being the *accuracy of the shooting*. The element *time* was, on the first establishment of the system, practically neglected.

For this competitive prize firing, each company in a group of Coast Artillery, has to fire sixteen rounds on one day, from the same work as the remainder of the group are to fire from, at similar targets and as far as possible, under exactly similar conditions.

The system so adopted in 1891, though no doubt it had many defects, has certainly given excellent results and very much improved the accuracy of the shooting of the Royal Artillery in all its branches. In the mounted branches however, it was soon found that great modifications were required in the system to suit their wants, especially as their armament and equipment became rapidily improved. These modifications we need not discuss here, except to say that generally, they were in the direction in which, in this paper, improvements are proposed for the Coast Artillery. The mounted branches have only been brought in incidentally and no further allusion will be made to them.

7. DEFECTS IN THE PRESENT SYSTEM.

With regard then to the Coast Artillery, the two principal defects of the system, as originally established, and which are now patent to us all, are :—

(D. 1.) That the factor "rapidity of fire" is practically absent, though within the last year a modification has been made which brings it in slightly and tentatively.

(D. 2.) And that a company is judged, not by its practice on many occasions or throughout the whole, but by that of a single day only.

There are no doubt, many other minor disadvantages, some of which are* :—

"A C.O. is induced to train his men more with a view to their "doing well at competitive practice than to their rendering a good "account of a hostile vessel."

That is to say, efficiency in shooting is sacrificed for success in shooting under limited artificial conditions, in many ways not resembling those of actual service.

" One method only of range-finding, the D.R.F. being used for competitive practice; other methods are, more or less, sacrificed to it."

It might be said more strongly, that they are very often completely sacrificed to it.

" During his preliminary course of training, a company C.O. has a "great deal to teach his men—is it to be wondered at that, when fire "discipline is taken in hand, the P.F. is shirked in view of competitive "practice, and all available time given to the D.R.F."

" One day makes or mars a company. It is classed and judged by "its competitive firing (of a single day), sufficient importance is "therefore not attached to the remainder of its annual practice, including shooting with P.F."

The B.C. is at competitive, and still more so at other service practice, burdened with much detail work which would not fall to his share, under service conditions.

There are many other smaller disadvantages which might be mentioned, but the above are quite sufficient to show that a change is necessary if we wish to progress, even in other things besides in rapidity of fire. As the father, more or less, of the existing system, it will be evident that I can speak freely, and without prejudice.

8. EXISTING ARRANGEMENTS AS TO DISTRIBUTION OF PRACTICE AMMUNITION.

Before entering upon an account of the important modifications it is proposed to introduce, it is necessary to explain, shortly, how the ammunition allotted to a station, for the annual practice is now distributed.

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* The sentences shown as extracts are taken from a very useful paper in R.A.I. " Proceedings" Vol. XXIII., No. 12, 1896, by Major (now Lieut.-Colonel) P. Saltmarshe, R.A.

A certain sum of money is allotted annually to the station, and ammunition to that amount, may be expended, in a manner left to the discretion of the G.O.C. or O.C.R.A. at that station, who is thus very wisely left a free hand, subject to the necessity of carrying out the equipment regulations as to what is termed "station practice." This particular practice has to be carried out, from every gun in the command, at stated intervals, for the complete testing of its mounting, etc.*

The natures of service practice for which the available ammunition is usually employed, are as follows† :—

(*a.*) "Regimental," carried out under the immediate orders of the Lieut.-Colonel, O.C. unit.

(*b.*) "Station" or "station and regimental combined," similarly carried out.

(*c.*) "Company practice" (including elementary).‡

(*d.*) "Company" practice—"competitive prize firing."

(*e.*) "Company Q.F. practice."

(*f.*) "Infantry" (training as artillery), "militia," and "volunteer" practice.

Although, no doubt, more could be done as to the organization and carrying out of the practices, *a*, *b*, *e* and *f*, they do not come under the scope of this paper, which moreover does not treat, in any way, of practice with Q.F. guns of any description; there is much to be said about the latter but, for the mode of giving rewards for it and the method of judging results, it may be found wise, in all probability to borrow almost bodily from the system pursued in the Navy. It is hoped to treat of Q.F. practice in a further paper, on another occasion.

Q.F. guns may be looked upon as "shoulder" guns, and as such their practice, more or less approximates to musketry practice.

However that may be, it is with the ammunition expended in practice *c.* and *d.*, that it is proposed to deal with here, the others only coming in incidentally.

9. DISADVANTAGES OF THE EXISTING SYSTEM OF COMPANY PRACTICE.

With regard to company practice, as now carried on, experience leads one to feel strongly that a great part of it is, more or less, thrown away; and that the ammunition usually allotted to it may be far more usefully employed for instruction of the company than it is at present.

C.O's of companies employ it at present, mainly towards qualifying their companies for the competitive practice carried on in the narrow limits already described.

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* So far as possible this compulsory practice is made to work in with some scheme of combined practice from several works.

† See "Instructions for practice seawards," 1897–8.

‡ "Elementary" practice should not be termed "service" practice in reality, for in the "elementary," service conditions need not necessarily prevail (see "Instructions for practice seawards," 1897–98; par. 12), as it is employed for training new gun-layers and young soldiers. Whereas at "service" practice all conditions should prevail, as far as possible, such as we might look for when actually engaged with an enemy.

In this practice also, (more even than in the competitive), the B.C. is made responsible for the keeping of all sorts of records as to time etc., which he certainly would not have to keep if he was firing at an enemy.

This is seriously opposed to service conditions, and also interferes sadly with his giving his undivided attention to his shooting and to the personnel and material of his work.

The records themselves, kept as they are mainly by those immediately concerned in them, are often very unsatisfactory, and frequently, though almost unconsciously, "cooked."

The subsequent mode also of criticizing the practice by written remarks only, upon the receipt of the practice reports, is tedious and wearisome to all concerned, and often results in the criticism being received by those most concerned, long after the practice has almost faded from their mind, and not as it should be, when perfectly fresh in their memories. It so loses much, if not the whole, of its possible good effect.

10. CHANGES PROPOSED IN COMPANY PRACTICE AND AS TO THE RECORDS OF THE RESULTS OF SUCH PRACTICE.

It is proposed now to make all company practice (elementary excepted), count as *competitive firing.*

In order to make this proposal practicable, it was, in the first place necessary to establish some system of record by which it would be possible fairly to compare the shooting, at any rate at each station, from the results of all the service practice carried out by them :—

(x.) Of the companies, at each station in any one year.

(y.) Of all the artillery at the station, from year to year; and to see, in this way, distinctly what progress or otherwise, is being made.

Such a system of record was, on the writer's initiative, definitely established in 1897.*

These records, taking in both time and accuracy, give the results by companies, of all the service practice for the year, and are ordered to be kept at every coast Artillery station.

Presuming these records to be carefully made, it is therefore now quite easy, (within certain limits,) to compare and to classify companies by the results of all their company practice in the year instead of by those of one single day's practice only.† This marks a great step in advance, for a means is thus provided, not only for showing what standard we reach to in any one year, but also for determining whether the shooting, as a whole, is falling behind, stationary, or progress-ing as it should do.* We have now a distinct "figure of merit," of "hits per gun per minute," by means of which it is easy to carry out the comparisons x. and y. above mentioned. The exact mode of working out the "figure of merit" is given in Appendix II.

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* See Royal Artillery R.O. of 1st. June, 1897, directing the results of service practice to be furnished in such a manner as to give the information required, and upon certain specified forms, "A" and "B."

† In some cases these results might be corrected by some factor for the nature of the gun and of the work fired from, as to height, etc., but this much complicates matters and is not believed to be at all essential.

In order that these records of results shall as far as possible, be actually reliable, more care will have to be taken in the future, to secure absolutely accurate and trustworthy data, as entered in the practice reports, of all the company service practice carried on, and to render "cooking" impossible, by completing all the records of the day's practice in the work itself. Any doubtful point as to these data being cleared up at the time, and criticism of the practice delivered without delay.

That this criticism should be made at the time, written down on the spot and then and there communicated to all concerned, is of the *first importance.* And also that all the officers and men concerned, be kept in the work until all the records, practice reports etc. have been finally completed, in ink, the results discussed in conference and the conclusions arrived at, communicated to the officers and men of the firing company and to all those attending the practice.

Not only will such criticism so delivered appeal to those firing much more directly than written criticism long after the event, but much time and labour will eventually be saved, at the cost of a certain amount of inconvenience at the moment, and by the application of more time, mind and effort on the day of the practice. This principle should be strenuously adhered to.

No doubt difficulties, many difficulties, will be urged; but such difficulties will soon vanish if all willingly put their shoulders to the wheel; they certainly have so disappeared at Malta, under these circumstances.

The manner in which the above mode of proceeding is practically carried out is explained in detail in Appendix I.; and a copy of the written critique on one actual day's practice is also given as a sample in the same Appendix.

11. MEANS TOWARDS ENCOURAGING RAPIDITY OF FIRE.

To commence with our drill; the "loading and firing," is at present much too slow, we should drill much more "against time," than is the usual custom.

The table shown on next page gives the times taken *at drill* by an average company here, and also the maximum times which should be allowed as good drill; it is believed that these might even be shortened.

Owing to the long time, (which varies also with the packing of the cylinder,) taken to run up heavy B.L. guns with H.P. mountings, the time of "loading" by itself, should also be worked up to with such guns and mountings, and they are therefore shown separately in the last two columns of the table.

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* It is also firmly believed that it will be further possible (within limits) in the future, to compare the shooting at different stations, one with another, with sufficient accuracy for all practical purposes. But this is in the womb of the future, though perhaps of the immediate future, see the interesting method, the idea of Lieut. P. K. Lewes, R.A. published in sequence to this paper.

Nature of gun.	CASE ONE. To load, run up, lay and fire.		To load only.	
	Average time.	Maximum time.	Average time.	Maximum time.
9-inch R.M.L.	1 min. 10 sec.	1 min. 15 sec.		
10 " "	1 min. 20 sec.	1 min. 30 sec.		
11 " "	1 min. 30 sec.	1 min. 45 sec.		
6 " B.L.		1 min.	0 min. 23 sec.	0 min. 25 sec.
9·2 " "	2 min.	1 min. 45 sec.	1 min. 19 sec.	0 min. 50 sec.
10 " "	2 min.	1 min. 45 sec.	1 min. 10 sec.	0 min. 50 sec.

Then as to the *actual shooting* :—

The *figure of merit,* or qualification of a company as to its shooting should clearly be made upon the results of the shooting, as to time and accuracy, and upon nothing else.

It seems highly illogical to mix up, in any system or competitive prize firing, the appraising of a company by marks, (given or taken away,) for its so called "fire discipline."

For "fire discipline," after all, whatever we may actually take it to mean, is simply one of the means leading up to the end i.e., the results obtained.

The existing system in which this is done is not only illogical, but it is very unsatisfactory, for the amount of marks given or taken away for it by different umpires vary much with the individual judgment and ideas of the umpire.

Whereas the evaluating of a company solely by the results of its shooting can not vary with any personal idea of an umpire, but depends solely on the efficiency in shooting of the company firing, as shown by the results, and upon the accuracy of the recorded data, by which we determine exactly what those results are in each case.

There might of course be errors in the records, but they would be errors of fact, or of judging, and not of judgment, and would probably be common to all the series fired.

Before the element of *time* was introduced into the results by which credits were gained at competitive prize firing, there was a certain amount of ground for marks being given for so called "fire discipline," for the element of time was introduced into the latter; even then, however, it was introduced in one of the means towards good practice results, (as to time and accuracy,) and not in the results themselves, and so was faulty.

It appears advisable that the "drill series" of the existing system of competitive prize firing, (for the purpose of adjudging the value of a company in shooting,) should now altogether be abandoned.

Not that the so called "fire discipline" should in any way be undervalued, as a most necessary means to an end, but the means should not be mixed up with the end itself.

Fire discipline should be much more thoroughly carried out and much more severely judged than it is at present.

That is to say, the fire discipline of a company judged, (irrespective of the shooting of the company towards which it is a means,) in the same way as any other points of discipline and drill are judged, e.g. :—

Conduct of a company,—by the amount of crime.

The training, or discipline, in infantry work,—by the way in which a body works as a company, alone or in battalion, on the parade ground; and so on.

In fact, the efficiency of this fire discipline, like that of any other discipline, should be judged by its effects, by the smartness and celerity of the gun drill, by the efficiency of the fire control exercised in a B.C. or F.C., by the efficiency or otherwise of the specialists (signallers, telephonists, range finders and gun layers.)

All these points should be frequently tested by inspection in manning a B.C. and so on, by the Lieut. Colonel, whose proper function it is to enforce such discipline.

He should, much more than he does now, frequently inspect companies under his command, either informally by being present when a company drills (as a spectator without interfering,) or formally by occasional inspection, surprise and otherwise, not merely at the annual inspection.

He should do so frequently and insist upon errors being corrected and a proper standard being worked up to.

At his annual inspection he should inspect stringently the tactical working of each company, see the specialists tested, a B.C. manned, and so on, and report specifically upon the various points, the aggregate of which, make up fire discipline so far as coast artillery is concerned.

But to return to the question of encouraging rapidity of fire:—

Competitive prize firing in H.M. Navy is carried out, not by the firing of a *given number of rounds*, as has hitherto been in vogue with us; but by *firing for a given time*. This latter seems the more sound, both in theory and practice, and in adopting it, in the new system proposed in this paper, a leaf has been stolen from their book. The Royal Navy has gone far ahead in gunnery and there is many a point to be learnt from its custom and practice, by the coast artillery.

It is proposed that for each work, a *given time*, (say from ten to twenty minutes,) be laid down, (according to the nature of its armament etc.) as that for which the company practice, (i.e. the competitive prize firing,) is to last, the B.C. being allowed to fire as many rounds as he can do, during that given time.

The credits allotted and the classification made being entirely dependent upon the two factors, the "accuracy," and the "rapidity," of the fire of the company in that given time; these two taken together, in the manner shown in Appendix II., giving the "figure of merit," of the company in its competitive prize firing of that particular day.

The same system to be persued in judging of the value of *all* service practice. As however, in the case of *combined* practice from two or more works, there exists at present many difficulties in the way of recording results, etc., though it is proposed that the results of combined practice shall be so judged and shown against each company firing at combined practice, it is further proposed that it shall not count as part of the competitive prize firing of the company for the year.

In time to come, it is hoped that the difficulties mentioned may be overcome and that by means of some practical method of reducing the value of the fire results, from any work, and from any number or nature of guns, to a common factor, it may become possible to value a company's shooting by the results of all its "service" practice during the year, whether "company" or "combined." The method proposed by Lieut. P. K. Lewes, R.A.,* seems to point to a possible solution.

It is very clear that the mode of carrying out the competitive firing now proposed is, in its conditions, as near that which we may expect to exist if actually firing at an enemy's ship, as it is possible to be in peace practice. *This is a most important point.*

Modern conditions of naval attack seem to make it probable, that an enemy's ship will only be in the fire area of a work for a very limited period of time, say ten to twenty minutes, whether she is passing it to make a reconnaisance, or running straight in towards it to get to close quarters to make a real attack, and that during that short period, it is most imperative that a coast work should deliver as many effective rounds against her as is possible.

The conditions of the existing system of competitive prize firing by no means correspond with the above, and are indeed very artificial.

12. PROPOSED NEW SYSTEM OF CARRYING OUT SERVICE PRACTICE AS COMPETITIVE PRIZE FIRING.

The new system very briefly described below, is by authority, being carried out in the Malta command this year, (1898-99,) and so far with excellent results, on the whole, and much to the satisfaction of all concerned, for it is evident that both officers and men recognize how much more nearly the practice under it, approximates to what would be their actual work in war, than the prize firing under the system so far existing.

Table Q. in Appendix III. shows the results of one days practice made under this new system, compared with the average results of the whole of the competitive prize firing of the year 1897-98 reduced to the same measure. It will be seen how far better it is than the best of that year under the existing system, and yet all concerned were quite fresh to it. We may hope for much better results, as they become more thoroughly accustomed to what is now so novel to them.

It is believed that the eventual adoption of the system, for the whole of the coast artillery, (with such modifications as experience in it may show are necessary,) will tend vastly to better matters and lead to as great an improvement in the tactical working and in the shooting of that branch as somewhat similar changes have brought about in the mobile artillery.

The proposed system is but very shortly described in this paragraph to show as clearly as possible, the main points in which it differs or not from that now existing, but a full description, with all the details necessary to be known by those who would have to carry it out, is given in Appendix I.

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* "Mode of obtaining a Figure of Merit, for comparing the shooting of different Companies, from different Works." R.A.I. "Proceedings," No. 4., Vol. XXVI.

(*a*). *As to ammunition*:—

The necessary amount to be allotted by the G.O.C. or O.C.R.A. at the station, for "station" or "combined station and regimental" practice. For "elementary" practice, a certain proportion to be placed at the disposal of the O.C's companies, for assisting new gun layers to get over gun shyness, for testing gun layers etc.; while to each company will be allotted a large amount of aiming tube ammunition and electric and percussion tubes for training purposes.

All the remainder of the ammunition available, for heavy or medium guns, (Q.F. excepted) to be used for *company service practice*, i.e. under the new system, *competitive prize firing*; this being divided amongst the companies at the station, as far as possible, equally, to be fired by each in a given number of practices, (the same number for each) and from the same works by the companies in each group.

The whole of this company practice *to be competitive*, and the companies to be judged and classified by the total results of this practice in the year. So that instead of the classification, prizes won, etc. depending on the results of one day's practice from a single work, they will depend upon the results of several days practice from different works, and on several different days.

(*b*). *Mode of arriving at classification from the results of practice.*

The present credits given for drill series and for so called "fire discipline" to be abolished.

With regard to this it may be safely taken for granted that those companies which have been best drilled and which have been best trained by the discipline necessary to ensure fire control and otherwise good tactical working, will certainly, other things being equal, be those which will make the best practice.

Major-General Richardson very truly says:—

"It is a great mistake to suppose that rapid work leads to "inaccuracy or that slow work ensures good shooting. In most cases "good shooting and rapid firing go hand in hand in competitive "practice, and training for the two should go together."

And again "The smartest will be the company which has managed "to pitch most shell into the target in the shortest time available for "actual practice."*

My own large experience as Commandant of the Golden Hill School of Instruction and as G.O.C. R.A., Malta, of the shooting of coast artillery leads me quite to concur in this opinion, for it has shewn me that (as might only be expected) it is the company best disciplined and trained to its work and the smartest at it, which, in nine cases out of ten makes the best shooting.

The companies will be grouped as at present, those in each group firing similar series from each of the works from which they practice.

Companies to be "qualified," however, simply and solely by the results of their fire in these several series, as judged by the "figure of merit" obtained in them, *i.e.*, by the "hits per gun per minute" made in the whole of the practices instead of as at present.

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* See R.A.I. "Proceedings," No. 3, Vol. XXIV., 1897.

The qualifying figures of merit,* classification, etc., to be, for the present, as under :—

First class, 0·25; second class, 0·20; third class, 0·15

(*c*). *Rounds to be fired at company practice (competitive prize firing).*

The rounds will not, as at present, be limited to any given number, but will be whatever number can be fired in a given time.

A given period of time† being laid down for each work from which the firing takes place.

$$\text{Say Fort X}\left\{\begin{array}{l}\text{2 10-inch B.L. guns}\\ \text{2 \ 6-inch \ ,, \quad ,,}\end{array}\right\}\text{10 minutes.}$$

(*d*). *As to targets, mode of reckoning, hits, etc.*

No change in these is brought into the new system, although it is considered that scoring against a "ship" target is much sounder in principle than scoring on the Record target, which, after all, like the ship target, must often be imagined not seen, being represented by two small targets for the stem and stern of it just as with the "ship" target.

Ricochets will still only reckon half a hit.

(*e*). *With regard to the range instrument to be employed.*

This will not always be the D.R.F. as has hitherto been the case with competitive prize firing, for the umpire will lay down the instrument which is to be employed at each practice, only it must be the same for each company of a group for the company practice from any one work.

The existing system, by which the D.R.F. is used at all competitive practice has very seriously handicapped that most valuable instrument the P.F., for naturally officers will, if possible, train their men entirely with the instrument with which the prize firing by which the company is judged is carried out.

(*f*). *Records of practice and criticisms on the same.*

These will be all completed in the work itself on the day of the practice and the criticism orally communicated on the spot instead of the records being subsequently made up from all sorts of pencil data, often incomplete and incorrect, and the criticism dragging a slow length along through days and weeks after the practice. Both these two are serious defects in the existing system.

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* The standard laid down for classification, under the present system, is too low; too many companies are able to qualify as first class, which makes it too common and so less valuable, this is so far satisfactory as it shows that the accuracy of fire has much increased, and that it has, as it were, "caught up" the standard originally fixed upon. But it is misleading and makes companies fancy at times that they have arrived at perfection, when, in reality they fall very far short of it.

† The limit of time would mainly be decided upon with a view to the average amount of ammunition which a company might be expected to expend in that limit. Previous practice from the particular work should make this a very easy matter, it certainly has proved so here.

Then again it has to be considered how much ammunition will be available, on the whole, for each company, and also, approximately, what number of separate practices it is intended that each company shall carry out,

With these data decided it is easy to settle upon the limit of time most advisable.

(*g*). *Prizes.*

It is not proposed, at present, to make any changes in these either in number or distribution.

The above are the main points, in which the new system proposed differs, or otherwise, from that now existing. All details necessary to ensure its being satisfactorily carried out are given in Appendix I.

There are a few points which I wish to emphasize, *à propos* to the subject, before leaving it.

1. My thanks are due to Lieut.-Colonel J. McDonnell, R.A. (who came to Malta on promotion from the R.H.A.) and, who, at my request, drew up a very useful memorandum for me, on the matter of practice, to which I am much indebted.

2. As to *matériel*, there is no doubt that even with the existing *matériel* and works at their disposal, Artillery officers can much improve tactical working and rapidity and accuracy of fire, by a hundred minor alterations and improvements. If they know their own minds on the subject of these and bring them clearly to the notice of the authorities—without being discouraged by delays and difficulties—they will, as a rule, find that the improvements will be eventually carried out, and that the shooting of their works will, by so much, be improved. It is proposed to show in another paper some of the many ways in which this can be done.

3. With regard to Q.F. i.e. shoulder firing guns, I am very strongly of opinion that the results of their firing and the mode of giving rewards for prize-firing, should be treated quite separately, and in a different way, from those in connection with heavy coast artillery.

APPENDICES.

I.—Details as to carrying out the proposed new system of company, i.e., competitive prize firing; with specimen of written critique upon one day's practice.

II. –Mode of working out the "figure of merit."

III.—Table showing the results of a day's practice in 1898 on the new system, as compared with the results of the whole of the competitive practice of 1897–98 on the existing system.

IV.—Method introduced by Brigadier-General (now Major-General) Owen, of rewarding good shooting at musketry practice by badges for the best shooting company in 1885–88, when Commandant of the South Australian Military Forces.

APPENDIX I.

Details as to carrying out the proposed new system of company practice as competitive prize firing.

1.—Prior to firing at practice.

(a). The company which is to carry out the practice, the work from which it will be carried out, the fixed time to be allowed for firing, and hour at which it is to commence will be notified in orders at least three days before it is to take place; (the hour for commencement should be as early as possible, for artillery sea ranges are usually most clear in the early morning).

The company which is to furnish the range party, the name of the range officer, and the place and time when he is to get his orders from the umpire will be published at the same time.*

(b). An umpire (not under the rank of Major, if possible) will be selected for each group; he will be assisted, if possible, by a captain or subaltern and by a small number of N.C.O.'s and men, (of a company other than that firing) for recording purposes. The above officers and men, as well as the range party, getting an overslaugh of duty.

The range officer will report himself to the umpire and receive orders from him as to the course to be run, etc.

The umpire will receive from the I.G. a filed copy of all critiques, so far made for the year, as a useful guide to him and the senior officer present at the practice; these he will return to the I.G. the day after the practice with his report.

(c). A roll of each company will be prepared at the beginning of the practice season in duplicate on the form given on next page; one being retained in the company and the other for umpire's use.

As soon as the order for practice is issued, the umpire will mark off on his copy, in the column for the particular practice to be fired, the officers, men and specialists who are to man the work for the firing with sufficient reliefs for casualties and pass to the O.C. company who will similarly note on his copy and return the umpire's copy.

The officers and men to be shown by sections excepting the D.E. specialists attached (the latter entered in red) all of whom will be shown separately below the last section in columns one and two.

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* The following is a specimen order as published for one such practice:—

(1). Service practice on the new system will be carried out on Monday, the 9th January.

Company to practice	17. S.
Work from which the practice will take place ...	D. Grazia.
Time allowed for series	12 minutes.
Hour for commencement	9.30 a.m.
Range officer	Lieut. J. A. P. Robinson.
,, ,, in waiting	2nd Lieut. A. G. Haig.
Company to furnish range party	27 S.

(2). Major C. H. Alexander is appointed umpire.

(3). The range officer will get from the I.G. a chart of the course and meet the umpire when and where he may arrange, to receive instructions.

(4). The service ammunition of the B.C. will be at the disposal of the officer commanding 17 S., who will arrange with the officer i/c sub-district regarding it.

Columns one, two and three will be filled in by the company commanders. The other nine columns will be prepared, with their headings, but will be left blank for subsequent completion by the umpire as each series is fired.

COMPANY ROLL.

Section of company or description of specialist.	Rank and name.	Employed permanently and how.	1st series.	2nd series.	Remarks.
			Work............... P.F. .... or D.R.F. Date		
(1)	(2)	(3)	(4)	(5)	(12)

N.B.—Colums five to eleven will be repetitions of column four for the second to the eighth series of practices.

These rolls will be signed by the company commander, and after each practice, by the umpire in column four.

In this way it will be ensured that each officer and man of the company takes part in one or other of the practices.

(d). The officer commanding the company will arrange as to *matériel* with the officer in charge of the sub-district in which the work is. Deficiency or defects in *matériel* will not be allowed as any excuse as regards time or accuracy on the day of the practice. They will have to be made good beforehand.

(e). The officer commanding company may, if he choose, man the work at any period within two hours of the time for the practice to begin. But in any case he will have his guns loaded and ready for firing by that hour.

This, it will be seen, is quite a service condition.

2.—*During practice.*

(a). The officer commanding unit to which the firing company belongs will always attend such practice.

(b). The umpire will be in the work at least fifteen minutes before the hour named for the practice.

The range party and launch will be entirely under him, and he alone during the practice, will send them orders by signal or otherwise. He will, at the hour named for beginning (if satisfied with the target's position and rate) sound the " commence firing " and at the end of the ten minutes or other fixed time laid down for the practice, will sound the "cease firing." No round fired after the latter sound has ceased will count for the company. The guns loaded at the time will be unloaded, if possible, otherwise they will be fired at the target, by order of the umpire.

During the practice the battery commander will give no orders by trumpet sound. The umpire will, usually, be able to arrange so that the range shall be clear for the short time allowed for the practice, but should it become blocked, he will sound "stand fast" and then "go on" when the range is clear, giving, on the whole, the specified time allowed before he sounds "cease firing."

He will order casualties but must, for any one work, give each commander the same number and nature of casualties for each series of practice, though not necessarily in the same sequence.

The umpire will cause all the necessary records, as to rounds fired, to be made in A.F., B 79—which he is responsible for—by himself, assistant, or time-keepers; and will also keep (or cause to be kept) notes as to any defects in, or accidents to, *matériel*; and also as to any patent faults in drill or tactical working which affected the accuracy or rapidity of the fire.

3.—*After the firing is completed.*

(*a*). The range officer will, at once, signal to the umpire, the range, under or over, of each round fired.* He will then land at the nearest point to the work and proceed there as quickly as he can with his range record book and the diagram of the course.

(*b*). The umpire will go round the work with the battery commander and the latter will then direct the manning detail to wash out the guns, to clean mountings, etc., to fill up depôts, and generally to proceed as they would do in war time after being in action against a hostile ship and expecting soon to engage another.

(*c*). The umpire and battery commander will then conjointly proceed with their assistants to complete in ink in the work itself the Practice Report (A.F., B 269) in duplicate. The particular portions for which they are severally responsible are given below;—

Umpire:—columns five, six, seven, eight, nine, eleven and nineteen.†

The umpire's estimate of right or left from centre of target will be entered in another column to be ruled in the report and numbered twenty.

Battery Commander:—columns one, two, three, four, ten, twelve, thirteen, fourteen and fifteen.†

To assist in preparing these practice reports:

The P.F. operators (of P.F.'s covering the fire area of the work) will be marched down, with their reports, tables of corrections, etc., within a reasonable time.

The Gun group Commander's will complete their reports in ink and also fill in form E. as soon as the duplicate (company) report is ready and hand them all to the Battery Commander.

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* Column nineteen of Practice Report can then be filled in in pencil by umpire, pending arrival of Range Officer.

† The numbers refer to the latest edition of A.F., B 269.

The umpire will have with him printed on hectographed forms, as under, which will be filled in by him in ink on the spot.

Table D.—Preventable errors.

Form A.—For that particular practice, to be filled in from his practice report when completed.

(*d*). As soon as the whole of the above have been completed, a conference will, at once, be held in the work, of the officers taking part in the practice and of all others present. These will always include the I.G., I.R.F., I.O.M., etc.

The following general course will be pursued. The senior officer present will call upon the umpire to point out the results of the practice, the figure of merit obtained and the preventable errors or defects in drill or the working of *personnel* or *matériel*, as he or his assistants have noted as affecting the practice. The specialist officers, Instructor of Gunnery, etc., will then remark on any points they have observed as requiring attention. The Battery Commander, Gun group Commander, Range Officer, and Range group Commander (if any) will afterwards make their explanations or remarks on the points brought forward, every officer being allowed free expression of his opinion.

Any doubtful point, *e.g.*, as who was responsible for errors committed or as to any defect in or damage to *matériel* being thoroughly gone into then and there until a clear and definite conclusion on the same has been arrived at.

(Notes on these points will be made by the umpire and the O.C. unit to which the firing company belongs for completing their subsequent covering reports—see below).

The records of the umpire, however, can, in no case, be impugned, they will be taken as correct as against any other data.

The senior officer present will finally sum up (putting the same in writing) giving his opinion on all the points brought forward.* He will also remark on the fire discipline of the company as shown by the drill and tactical working during the practice—this being entirely his province and not that of the umpire, (who is chief observer and responsible director of the practice, though without interfering with the actual fighting of the work). The criticism thus made will be final* as to the days' practice, unless the O.C. or G.O.C. of the district, on receipt of the reports next day, wishes to make any general remarks to be published to those concerned.

(*e*). As soon as the conference is over the B.C. himself or through his officers will explain to the N.C.O.'s and men faults or errors committed by them, or as to defects in *matériel*, etc. He will then " replace stores " and march them home.

N.B.—Until the whole of the above is completed no officer or man concerned in the practice will quit the work.

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* A specimen " critique " is given at the end of this appendix.

(*f*). Upon the same day, or at latest the next day, the following will be sent to the I.G. at district head-quarters, for the information of the O.C. or G.O.C. R.A.

By umpire :—original practice report, A.F., B 269 complete, with his own covering report, accompanied by R.O.'s report; Table D (of preventable errors); Table (new Form A); G.G.C's report (B); G.G.C.'s Form E.

By O.C. unit (to which the firing company belongs):—a memorandum covering; the B.C.'s report on the practice; and the ship diagrams, as worked out by the C.O.'s officers.

(*g*). The records, so completed, are filed in the I.G.'s office ready for eventual transmission and for the making up of the annual report for the year, Form A for all companies being kept by him up-to-date.

No further correspondence of any sort will take place as to the practice unless, as before mentioned, the O.C. or G.O.C., R.A. wishes to send extracts of his own notes on the final critique to any officers for their information and retention.

CRITIQUE ON SERVICE PRACTICE (AS A SPECIMEN).

Date	21.11.98.
Officers of Company	Major C. H. Milward and Lieut. M. H. C. Bird.
Company firing	17/E.
11 series	15 practice.
Work	Garden Battery.
Range instrument used,	P.F Case II and D.R.F for dead water from P.F.
Guns	1—9·2″ B.L., 2—6″ B.L.

Time allowed for series, twelve minutes,
Average range, yards 1,963.

General Remarks.

The weather fair but changeable, sunshine and cloud alternately; a fresh breeze from eastward cleared away the smoke quickly; on the whole a very favourable day.

There was some bungling on the part of the range officer; he could not see signals* but should have come in closer to find out what they were.

The eleventh round (No. 19) struck rear target and turned it over, so for the last nine rounds there was only one target to fire at.

At round seventeen† (A/1 6″ B.L.) the projectile broke up in the gun.

As to adjuncts used.

See reports on practices twelve to fourteen.

The rear sighting steps of the 6″ B.L. were fixed up out of the way; at A/1 tied up with rope by gun detail; at C/1 kept so by an alteration made by I.O.M. using a special spring.

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* It will be better for this work to have a second set of signals hoisted at Cambridge whence they can be more easily seen from the launch.

† One splinter apparently reached to 150 yards of target, others struck water in different directions 300 and 500 yards from the work.

Firing by electric lanyard; one miss fire at B/1 round thirty-two, the fault of gun-layer.

As to matériel.

On the whole all worked well; at A/1 6″ the recoil was not sufficient for first two rounds owing to new asbestos packing of cylinders.

At B/1 9·2″ the recoil was very violent and did some damage due to amount of air. The air screw means of escape is quite insufficient for the purpose with this gun and seriously interferes with rapidity of practice.

Rounds lost.

(*a*). *As to direction.*

Three rounds lost.

2nd No. 15 shot falling 35 L.
4th „ 17 „ „ 25 „
7th „ 20 „ „ „ „

B.C. gave no deflection until ninth round (No. 22) when he gave 10 R. to A/1 6″. At thirteenth round (No. 26) he gave 10 R. to the other two guns with results four rounds L. three rounds R.

It would have been better if he had given 10 R all round to begin with.

(*b*). *As to range, etc.**

No rounds were lost as to this; though some only scored $R = \frac{1}{2}$.

B.C. gave no correction to 6″ B.L. until fourteenth round (No. 27) when he gave + 50.

To 9·2″ he gave a normal correction of + 100 increasing to + 125 giving – and then to + 175 which gave +.

Loss of time.

At least a minute was lost at A/1 due to hard packing, and at B/1 (9·2″) much time was lost in letting out air by air screw for reason explained above. This was due to defect in material, also a little on account of miss fire with electric lanyard due to the gun-layer.

Service, etc.

Very good, smart and quiet.

Lever lengthening cam lever, well applied.

Gun-layers very good at their work, one error of gun-layer as to damage of electric lanyard leads (tube).

Some minor faults in words of command, etc., as given in a/I. of G.'s report.

Mode of fire "slow" up to third (No. 15) after that "independent group salvo."

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* It will be advisable to enter summary of range corrections and results for each service practice in Fort Record book briefly as a guide.

Results.

A/1 gun 8 rounds. B/1 „ 4 „ C/1 „ 8 „	20 rounds in 12 minutes 17* hits, making 0·472 "hits per minute per gun." R = 1. 15* hits, making 0·416 "hits per minute per gun." R = ½.

A/1 and C/1 6″ maximum rate — 1½ minutes per round.
Average rate 1·8 minutes per round.

Times.

Practice commenced	10 h. 43′ 48″	Breaks, one due steamers on range from 10 h. 55 m., 32 s., to 11 h., 2 m., 30 s.
„ ended	11 h. 2′ 36″	
Records completed for conference	12′ 40″	
Conference ended	1′ 10″	

(Initials) J. F. O., M.G.

21st November, 1898. Senior officer.†

Officers present.

Senior officer : Major-General J. F. Owen, R.A.
Umpire : Major H. F. E. Goold-Adams, R.A.
Colonel deC. Daniell, R.A., O.C. Central.
Lieut.-Colonel W. F. Graham, R.A., O.C. Western.
Captain F. L. Playfair, R.A., as a/I of G.
Captain E. H. Robinson, A.O.D., I.O.M.
Captain E. W. Spedding, R.A.
Second Lieutenants W. L. Browne, A. G. Haig, H. E. S. Wynne, R. C. J. Alexander, W. F. Parsons and A. F. B. Fishe, R.A.
Lieutenants Carbonaro and Falzon, R.M.A.

APPENDIX II.

Mode of working out the figure of merit.

To obtain the "figure of merit" of a company from the results of its annual practice (shown by the record of the same in the authorized "Form A" and epitomized in the "Form B") we proceed as follows :

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* One shot 17th round (No. 29) broke up. For this the average of other rounds was allowed giving it 0·75 hits.

† To be initialled here by senior officer present making the critique, with date.

FORM A.—The results in column nine (hits per gun per minute) are arrived at by the formula :—

$$\frac{H}{T \times n} = \frac{\text{No. of hits.}}{\text{Total time} \times \text{No. of guns.}}$$

Thus "X" company practice 1st series.

$$\begin{array}{l} H = 10\tfrac{1}{2} \\ T = 29 \\ n = 2 \end{array} \quad \frac{H}{T \times n} = 0{\cdot}181 \text{ (about)} = \left\{ \begin{array}{l} \text{Fig. of merit for} \\ \text{this series.} \end{array} \right.$$

FORM B.—The average hits per gun per minute for all the practices of a company (filled in in column eight of that form) are obtained by the formula.

$$\frac{H''}{S''} = \frac{H''}{\text{Sum } (T \times n)} \quad \text{Where H}'' = \text{the sum of H of each series.}$$

Thus for "X" Company H″ = 54½. Then :—

$$S'' \text{ sum} \left(\begin{array}{ll} \text{series 1} & 58 \\ \text{series 2} & 72 \\ \text{series 3} & 42{\cdot}5 \\ \text{series 4} & 18{\cdot}7 \\ \text{series 5} & 66 \\ \text{series 6} & 186 \end{array} \right) = 443{\cdot}2 \text{ for the six series fired.}$$

$$\frac{H''}{S''} = \frac{54{\cdot}5}{443{\cdot}2} = \left\{ \begin{array}{l} 0{\cdot}123 \text{ (about) figure of merit of all the practice} \\ \quad \text{of "X" Company, whether "company" or} \\ \quad \text{"combined."} \end{array} \right.$$

FORM A., FOR X COMPANY, S.D., R.A.

Work and height.	Date.	Nature and Number of guns.	Nature of practice.	Rounds fired.	Hits.	Time, minutes.	Hits per gun per min.	Range instrument used.	Average range.	Remarks.
W. 129	18. 8. 97.	2, 6″B.L. H.P.	Company	14	10½	29	·188	D.R.F.	1821	
W. 129	25. 8. 97.	" " "	"	24	19	36	·264	"	2172	
X. 74	29. 1. 98.	4, " "	"	16	9½	10·62	·224	"	1789	
Total averages		8 guns	Company	54	39	75·62	·226	D.R.F.	1927	
Y. 84.	8. 11. 97.	1,17·72″R.M.L	Combined	4	2	18·75	·107	D.R.F.	1393	
Z. 89.	8. 11. 97.	1,6″ B.L. H.P. 1,11″ R.M.L.	"	8	7	33	·106	"	1640	
W. 129	25. 4. 98.	2,6″ B.L. H.P. 1,9·2″ " "	" "	18	6½	62	·035	P.F. III	2513	
Grand total for all practice		14 guns		84	54½	189·37	·123		1886	

APPENDIX III.

COMPARISON OF SOME PRACTICE UNDER THE PRESENT AND PROPOSED SYSTEMS.

The table below shows:—

(1). The average results of the competitive firing of 1897–98 at Malta, all being from Fort A.

(2). Results of the firing of one company, the best so far, from Fort A in 1898, under the new system of company practice (*i.e.*, competitive prize firing).

In both cases the guns used were 6″ B.L., on H.P. mountings.

TABLE Q.

Practices.	No. of rounds fired.	Time in which fired.	No. of hits.*	Hits per gun per minute.	Range instrument used.	Average range.
1	96	86½	54½	0·157	D.R.F.	1837
2	26	7½	15½	0·516	D.R.F.	2108

APPENDIX IV.

INTRODUCTION OF REWARD OF SHOOTING BY COMPANY BADGES.

When in 1885, I took over the command of the military forces of South Australia as their commandant, I found that their rifle shooting was very inferior in quality to what I had expected and to what they themselves judged it to be.

Their infantry forces, principally a paid Militia (i.e. practially paid according to the number of days called out) but consisting also partly of bodies of volunteers proper, were supposed by themselves and their public, to be at least excellent shots, and one had, before arrival there heard so much of their rifle-shooting that one was, until one went thoroughly into the matter, inclined to take the universal idea as correct.

As soon however as it was possible to acquire sufficiently reliable statistics on the subject, it became evident that all had been labouring under entirely false impressions as to their shooting powers.

Deceived as our volunteers in England at one time were, by the fact that there were amongst them a tolerable proportion of excellent shots, who showed up at every rifle contest possible, it was imagined that these good shots were but a sample and specimen of the remainder, i.e. of the large majority of their forces, whether militia or volunteer.

As a fact they were not so but quite exceptions, for this remainder, i.e. the greater part of the men, shot badly, and it evidently was necessary to take every possible step to increase their efficiency in this respect.

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* At an imaginary "Record" target in both cases. Ricochet hits = ½.

If a man found after being a little time in the forces, that he was not likely to become so very good a shot as to be able to compete successfully in rifle matches and so on, he became as a rule, very indifferent to shooting, and merely fired away the government allowance of ammunition at the ranges, in order to gain the pay allowed for the time spent in this musketry practice. This pay was, under the regulations then in force, allowed to be drawn whether any score was made or standard reached to or not, so there really was no incentive under the circumstances for a man to take any trouble in the matter.

The regulations on this point were soon altered; and it was pointed out that what was really most essential with any military force, was that all should be able to shoot fairly well, say up to such a standard for example, that no one would miss a haystack at 500 yards.

If in addition to this there were a number of excellent shots, so much the better, but the great desideratum was that all should come up to a certain standard, say the "haystack" standard. This was not at all a palatable doctrine to begin with, and there was considerable difficulty in enforcing the conviction of its truth. It was evidently necessary to give some strong incentive in the direction required, and the idea occurred to me that it might be given by a mode of prize giving which would spur on each company to have as many men as possible who came up at least to the "haystack" standard, while also not losing sight of the advisability of having further, as many very good shots as possible.

The mode adopted was as follows:—I presented a large silver shield, to be held for a year by the best shooting company of the forces, and induced the government to allow the free issue to this winning company of a distinctive badge, to be worn for a year by every member of it; gold badges for the officers, silver for the N.C.O's, and worsted for the men. The title of the winning company to be also inscribed on the shield.

That company held the shield and wore the badges for a year, which gained the highest "figure of merit" in the annual musketry course.

The manner in which it was arrived at was as follows:—

(1). In order to encourage a company to have as large a percentage as possible of its strength, fairly good shots; the percentage of its numerical strength, which shot up to a certain fixed standard, the "haystack" one or higher, was taken as one factor towards the figure.

(2). And to encourage it also to have as many very good shots as posssible; a second factor was laid down, viz. the average score made bythe officers and men composing the percentage of the company shooting up to the fixed standard.

Thus taking a company, say 100 strong, of which eighty five per cent shot up to the standard, and in which the average score of these eighty five was sixty per cent of the maximum score which could be made, the "figure of merit" of this company would be 85 multiplied by 60 i.e. 51.

Great emulation was produced by the adoption of this system, and it was found possible to raise the fixed standard each year and very considerably to improve the average musketry shooting of the whole of the forces, in a most satisfactory manner and at a minimum of expense.

On my return to England and taking over the command of what was then developing into an important school of instruction for coast artillery in shooting at Golden Hill, in the Isle of Wight, it was suggested by me that some similar method of rewarding companies, (or batteries) of artillery, by company prize badges should be adopted.

This suggestion was eventually adopted by the authorities, and I think all gunners will acknowledge with singular success.

MODE OF OBTAINING A FIGURE OF MERIT, FOR COMPARING THE SHOOTING OF DIFFERENT COMPANIES, FROM DIFFERENT WORKS.

— BY —

LIEUTENANT P. K. LEWES, R.A.

[Lieut. Lewes has allowed me to say a few words of introduction to this very interesting description of the mode he proposes, by which it is hoped that, in time to come, through the keeping of careful records of the shooting of Coast Artillery at all stations, in the manner now officially ordered, we may eventually be enabled to compare, satisfactorily, within limits, the shooting of any company with that of any other company, whereever stationed and from whatever work and guns they may respectively practice with.

The method proposed by him is a very sound one, I think, and promises well.

Nor must it be, for a moment, supposed that the end aimed at, is merely a theoretical one—quite the contrary—it is in fact a practical one and one of great importance if we wish to improve the shooting of our Coast Artillery; if, in time, we are enabled by means of it, to say of a company, (wherever quartered and whatever the conditions under which it carries on its practice for the year) this company shoots well or badly, as the case may be; it falls short of the proper standard by so much, or otherwise.

We should be brought into line with other arms, as to that definite comparison of the proficiency in shooting of one unit with another, which is so necessary for stimulating emulation, for enabling us to reward advance and zeal, and to discourage, and if requisite, to penalize inefficiency and incompetence.—J. F. Owen, Major-General, Malta, 6 January, 1899.]

AS it has been urged against the Figure of Merit "Hits per gun per Minute" that the calibre of the gun is not taken into account, and also, that when using this figure various corrections should be made to compensate for height of work, probable accuracy of the guns, &c., &c., it seems desirable, if possible, to fix a figure of merit which shall be free from these defects.

This may, to a great extent, be obtained if the figure be so taken as to express a proportion only, instead of a definite quantity, as hits per gun per minute.

For example, if instead of the figure being simply hits per gun per minute, it were :—

$$\text{(A)} \quad . \quad . \quad \frac{\text{Hits per Gun per Minute obtained,}}{\text{Hits per Gun per Minute possible from the work.}}$$

then, no matter what the height of the work or probable error of the guns, the figure of merit so counted would express the value of the company firing, as obtaining a certain proportion of the effective hitting power of the work. And the company obtaining the highest proportion would be the best.

The denominator of the above factor would have to be determined for each work from considerations of the natures of the guns and mountings and facilities of service, &c., but even so, it would not be altogether satisfactory, as a hit from a heavy gun would still only count the same towards the figure as one from a lighter gun, supposing more than one nature to be mounted in the work. That is, the calibre of the gun is still disregarded.

2. It seems better, therefore, to take some other basis than the actual hits per gun per minute upon which to found the figure of merit.

Suppose now that the striking energy be taken as the basis; then the calibre of the gun is accounted for; and, if the figure be computed in a form similar to (A) on previous page, i.e., as the proportion :—

$$\frac{\text{Actually obtained}}{\text{Possible from the work.}}$$

it is clear that the variable factor, "height of work" will vanish if the components of both numerator and denominator be counted over the same ranges.

The factor, "probable accuracy" need not be considered, for it will introduce no unfairness if we assume that each gun in a work should hit the target every time.*

All then that has to be settled in working out the denominator, is the maximum rate of fire obtainable from the work in question.

This will be the greatest rate at which each gun can be loaded, laid and fired† independently, and the denominator of the fraction will be the sum of the striking energies obtainable by the guns of the work if each were loaded, laid and fired as rapidly as possible between the limits of the ranges of the practice.

The numerator of the fraction will be the sum of the striking energies actually realized by the hits of the company firing.

The fraction will then stand thus :—

$$\text{(B)}\quad \frac{\text{S.E. realized by the hits of the company firing.}}{\text{S.E. possible from the work at the ranges and in the time fixed for firing.}}$$

The striking energy possible is arrived at from consideration of the fixed quantity above mentioned, (maximum rapidity of fire possible for each nature of gun), and the usual data as to remaining velocity &c., &c.

In Table I., attached, are given the results of certain practices at Malta, in which the Figure of Merit has been worked out by this formula, shewing how they compare with the figures of the same practices worked out in the usual way.‡

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* For the figure of all companies practicing from the same work will be reduced by the same amount, (viz. the proportion the probable accuracy bears to the assumed absolute accuracy) and it is shewn later how practice from one work may be directly compared with that from another.

† This maximum rapidity of fire would have to be laid down as a fixed quantity for each nature of gun.

‡ "The shooting of our Coast Artillery, and how to improve it." by Major-General J. F. Owen, R.A., Appendix II., Form A. R.A.I. "Proceedings" No. 4., Vol. XXVI.

It will be observed that where the guns in the work are of the same nature and consequently of the same striking energy, the figures of merit arrived at by the two methods are practically identical; but that where these striking energies differ, i.e., if there are different natures of guns, there is a considerable difference in the value of the figures obtained.

This is easily explained, for one company may do better than another with the guns having higher striking energies but yet not so well on the whole as to hits in time per gun as another which has fired better and more rapidly with the lighter guns.

The first named company would then not appear so good as the second if judged by "hits per gun per minute," but still it might realize a greater proportion of the possible S.E. of the work and thus become first if judged by this method.

An example of this is shown by "A" company firing from Fort X, Table I.

Here the figure given by the usual method is considerably greater than that by this method because all the hits were made by the lighter guns and none by the heavy one. Similarly the places of "E" and "F" Companies are reversed in the table by the Figure of Merit based on striking energy. The reason being that "E" Company does well with the heavier guns and "F" only gets two ricochets from the same, although more are obtained by it with the lighter natures.

3. In time, if this method be used, it will be quite easy to assign a certain factor to any work as the factor of effect of that work as compared to any other.

That is, the practice from one work may be directly compared with that from any other, by dividing by the factor of effect of the first work with respect to the second.

And, if some one work be taken as a standard, and the factors of effect of all works be recorded with respect to it, then the practice from all works can be reduced to a common standard and the comparative merits of all companies can be at once found.

These factors cannot, naturally, be obtained at once; but, in course of time, they may easily be arrived at.

4. - It must be assumed that if a large number of practices from different works be taken and the average figure of those from each work obtained, the differences shewn by these average figures will be due, not to difference in the shooting of the various sets of companies, but to factors depending on the local features of the works themselves; such as, facilities of command, communication of orders, means of passing ranges, &c., &c.

This will, obviously, be the case if sufficient different series can be averaged at each work and the only question is as to what numbers will suffice for a first approximation; certainly not less than twenty and it is unlikely that these will be obtained under three years.

5. This necessitates the keeping of careful records of the figures of merit of all practice—

I. By Stations.
II. By Works.

These records would, in course of time, give the shooting of a large number of companies at different stations and from the various works at those stations.

Then, in the course of three years or so, when the records shew the shooting of not less than twenty companies from each work, the average figures for the works would be taken and the work shewing the highest average would be used as the standard and the factors of effect of all the others with respect to it would be worked out.

This, perhaps, would not give a very accurate comparison but would be good enough as the first approximation and, at any rate, would be better than no comparison at all.

As time goes on, fresh averages would be taken and new factors of effect worked out; thus, in the course of ten or twelve years, a very accurate means should be obtained of comparing the shooting of garrison companies all over the world.

6. The factors are obtained as follows:—

Suppose twenty series to have been fired from work A with an average Figure of Merit 0·4 and that other twenty series have been fired from work Z with average figure 0·3.

Then, on the above assumption, the seperate figures of merit from Z must be multiplied by $\frac{4}{3}$ in order that they may be compared with those from A.

That is, the factor of effect of Z with respect to A is $\frac{3}{4}$.

7. The following example of service practice from one of the works at Malta shews the method of obtaining the Figure of Merit on the lines indicated above.

The guns in action were one 9·2″ and two 6″ B.L. on H.P. mountings.

It is, at present, here laid down that a 6″ B.L. on these mountings should fire at the rate of one round per minute and that a 9·2″ B.L. should fire a round every two minutes.

The time allowed for firing was twelve minutes.

The range when commence firing sounded was 3025 yards and during the twelve minutes allowed, it decreased to 2500 and then increased again to 2550 at which range the cease fire was ordered.

(1). To obtain the denominator:—

Assuming that each gun is ready to fire half-a-minute after the order to commence and that they all fire independently as rapidly as possible, it is found that the 6″ guns should each fire at the following ranges, viz. 3000, 2950, 2900, 2850, 2800, 2750, 2700, 2650, 2600, 2550, 2500, 2550; and that the 9·2″ should fire at 3000, 2900, 2800, 2700, 2600, 2500.

These ranges give a total striking energy for the three guns of 69216·59 foot-tons. This is the denominator.

(2.) To obtain the numerator.

This is got from consideration of the hits actually obtained by the company, shewn on the following table.

Gun.	Range.	Remarks.	Striking Energy.
9·2″	2925	Ricochet ½ value	3355·9 foot tons.
6″	2650		1180·9
9·2″	2625	Ricochet ½ value	3543·49
6″	2550		1217·3
6″	2500		1235·8
6″	2500		1235·8
9·2″	2525		7217·22
6″	2550		1217·3
		Total	20203·71

This gives the numerator, and the figure of merit is:—

$$\frac{20203{\cdot}71}{69216{\cdot}59} = 0{\cdot}291$$

In computing the possible striking energies the ranges are taken to the nearest twenty-five yards, and in all cases the value of a ricochet hit is taken as half that of a direct hit.

8. A table of striking energies (see Table II.) has been prepared for every gun in the command, from which service practice is carried out, for every twenty-five yards from 1500 to 3000 yards.

At the head of the table is given logarithm (W÷2g. ×2240) for each nature of gun.

By the aid of this logarithm any other striking energy not in the table may be at once found by only two references to the logarithm tables and thus the figure of merit of any ordinary series of service practice may be worked out in less than five minutes.

Note —For Tables I. and II. see next page.

TABLE I.

Shewing the results of three series of service practice by figure of merit counted in two different ways.

Work.	Armament.	Company.	FIGURE OF MERIT.	
			By Striking Energies	By hits per gun per Minute.
Z	3 or 4 B.L. guns on H.P. Mountings, all of same nature.	A	0·156	0·150
		B	0·167	0·167
		C	0·067	0·066
		D	0·312	0·306
		E	0·070	0·083
		F	0·352	0·350
		G	0·542	0·516
Y	1 heavy and 2 lighter B.L.guns on H.P. Mountings.	D	0·291	0·195
		C	0·285	0·195
		G	0.179	0·133
X	1 heavy and 2 lighter B.L. guns on H.P. Mountings.	E	0·385	0·236
		A*	0·128	0·194
		F†	0·322	0·388
		B	0·466	0·416

* A Companv, at Fort X got no hits from the heavy B.L. gun.

† F Company, at Fort X only obtained two ricochet hits from the heavy B.L. gun.

TABLE II.

Table of the striking energies of certain guns at every 25 yards from 1,5000 to 3,000.

Log.$\frac{w}{2g \times 2240}$ =6″ B.L. $\bar{4}$·8409905.........12·5″ R.M.L. $\bar{3}$·7537438.
=9·2″ B.L. $\bar{3}$·4207741.........11″ R.M.L. $\bar{3}$·5813532.
=10″ B.L. $\bar{3}$.5399605.........10″ R.M.L. $\bar{3}$·4537744.

Range.	6″ B.L.	9.2″ B.L.	10″ B.L.	12.5″ R.M.L.	11″ R.M.L.	10″ R.M.L.
1500	1689·7	8613·33	11233·25	9257·8	5364·4	3998·9
25	1676·7	8574·25	11173·4	9214·3	5337·3	3978·7
50	1663.7	8537·27	11113·6	9170·9	5310·2	3958·5
75	1650·9	8499·39	11084·0	9142·0	5292·3	3938·4
1600	1638·1	8461·55	11034.5	9113·3	5274·3	3925·7
25	1625·3	8433·24	10997·4	9070·1	5247·4	3905·0
50	1612·6	8376·26	10960·35	9041·4	5220·6	3885·1
75	1600·0	8357·99	10911·1	9012·7	5202·8	3865·1
1700	1583·7	8320·49	10862·0	8984·1	5185·0	3851.9
......	......	......	......	......	......	......
......	......	......	......	......	......	......
......	.....	......	......	......	......	......
3000	1062·7	6619·62	8732·01	7402·5	4260·9	3104·9

AMMUNITION COLUMNS FOR MOUNTAIN OR IRREGULAR WARFARE.

— BY —

MAJOR H. C. C. D. SIMPSON, R.A.

THE object of this paper is to invite discussion on the above subject, from officers who have served with mountain batteries in the recent expedition on the North West Frontier of India or with Mountain or Maxim Batteries in the Soudan Expedition.

Although our home and colonial establishments of Mountain Artillery are limited, still a large number of mountain guns, manned as a rule by natives under British officers, are now engaged in active operations in the field; and Africa and the Eastern Mediterranean Hinterland seem likely to prove for officers, and to a less extent to N.C.O.'s and men of the above establishments, what the Indian Frontier has proved itself to be as a happy hunting ground to the Mountain Artillery of the Indian establishments. I have included Maxim batteries because although admitting that the machine-gun is but a cluster of rapid-firing rifles and in regular warfare perhaps more aptly handled by infantry in sections, still when massed in a battery, in irregular warfare, their tactics and transport are those more pertaining to artillery than to infantry and thus renders it advisable that they should be organized by the artillery arm rather than by the infantry, whose legitimate duties have a greater claim on their services under these circumstances. However whether worked by infantry or artillery, Maxim guns as well as mountain guns and rifles require a large supply of ammunition to be transported for them in the field, and it is evidently desirable that tables should be formulated detailing the requirements of an ammunition coloumn in *personnel*, equipment and ammunition, to meet the various conditions of service and pack transport. I include also the carriage of Field Artillery ammunition when the greater portion of the ammunition has from circumstances to be carried in pack transport in common with that for the mountain batteries.

Most of the great continental Powers maintain in peace at their mountain artillery depôts a nucleus capable of ready expansion in war to a serviceable mountain ammunition column. The details for the tables of these columns have not been determined moreover without experience in the field of their necessity. Thus Russia in the Balkans and Western and Central Asia; France in the Pyreneean Campaign at the commencement of the century, also more recently in Algeria, Tonkin and Madagascar; Spain in her numerous Carlist wars, in Morocco and in her Colonial Islands; Austria in the campaigns of the Tyrol and Bosnia; Italy in the Alps and recently in Erithrea; and the Dutch in the East Indies have all learnt useful lessons which they have not hesitated to profit by.

As regards ourselves, beyond a 50°/₀ of reserve artillery ammunition laid down to be carried with the ammunition lines of the Mountain Batteries, with, in addition some crude provision in India in the form of field parks improvised hastily on the outbreak of war, no tables exist as guidance for the formation of artillery and infantry pack ammunition columns on a satisfactory basis of organisation that I am aware of.

A consideration of the arrangements made in this respect by the Powers referred to may, perhaps, be interesting and useful to officers of the British Mountain Artillery.

AUSTRIA.

Ammunition parks and columns are known under the general designation of Reserve Artillery establishments. A mountain division ammunition park is attached to each infantry division equipped for mountain warfare and is so organised that it can, if necessary, be divided into three sections, one for each of three mountain brigades of which a mountain division usually consists.

The *personnel* of a Mountain ammunition park is made up of detachments from Mountain batteries and technical (siege) artillery. Its exact strength is not laid down, but depends on the special circumstances of each case; such, for instance, as to whether the transport is by pack animals or by wagons, and in the latter case, whether the wagons are supplied by the train or are requisitioned country wagons.

The ammunition carried is 100 rounds per mountain gun and thirty rounds per rifle, besides explosives for engineer purposes.

The artillery of a Mountain brigade consists of one Mountain battery and of a Mountain division of three Mountain batteries (one per brigade) and two to three Field batteries (reserve artillery of the division). Army ammunition field depôts are organized according to special instructions, which are issued to meet the requirements of the particular theatre of operations. In addition to the necessary reserve they are required to keep up for field and horse artillery guns, 150 rounds have to be kept up for each mountain gun on the establishment.

RUSSIA.*

There are maintained in peace "cadres" for a certain number of "flying parks," which constitute the first reserve of ammunition in the field. Amongst these cadres provision is made for one mountain artillery flying park consisting of 128 pack animals for artillery ammunition transport, required on the mobilization of the Mountain Batteries of the 13th, 20th, 21st, 38th and 39th Brigades and two mountain artillery "flying parks" of three sections each for the Horse Artillery Mountain Regiment. The second line of ammunition supply is formed by the "mobile parks," which on mobilization provide for one section of a mountain artillery "mobile park." The third line of ammunition supply is formed by the "local parks," amongst which is one local park for mountain artillery.

The *personnel* of a mountain artillery "flying park" consists of three officers, eighty-seven combatant and non-combatant N.C.O.'s and men (with four horses). For the "mobile parks" small cadres varying in strength according to the number of parks grouped in one depôt are maintained in peace to look after the *matériel,* but that of the "local parks" is stored in the artillery depôts and looked after by the *personnel* of these depôts.

The war strength of the above parks is as follows :—

For flying park :—Three officers, three officials, 423 combatant and non-combatant N.C.O.'s and men, 329 horses (of which 192 are pack) and ammunition for each gun, forty ring, forty-eight shrapnel and eight case shot, 53·3 rounds per rifle and eighteen rounds per pistol and nine carriages.

For the section of mountain artillery "mobile park" :—Thirty combatant N.C.O.'s and men, seventy-three horses and twelve artillery carriages and ammunition for each gun, 17·25 ring, 20·25 shrapnel, three case shot and six rounds per pistol.

For the "local park," for each mountain gun is carried 105 ring shell, 125 shrapnel and twenty case shot and twenty-five rounds per pistol. Each mountain artillery ammunition "mobile park," moreover, is equipped with sixteen axes, thirty-two shovels, eight pick axes, eight mattocks, two crowbars and two saws. Per gun the total proportion of mountain artillery ammunition in the field is 482·5 rounds.

ITALY.

The Mountain Artillery Depôt in peace practically constitutes the nucleus of the ammunition column and section of park required for the Mountain Batteries on a war footing.

The strength of an ammunition column is one officer, fifty men and thirty-three mules carrying twelve rounds of common and forty-eight of shrapnel shell per gun, five shovels, five picks, one light axe, two hatchets and twelve torches.

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* Some modifications are being made in these establishments.

The section of park consists of one officer, eighty men, fifty-two mules and eighteen two-wheeled carts, twenty-four common and 120 shrapnel shell and six case shot per gun, fourteen shovels, fourteen picks, eight choppers, eight light axes, four saws and thirty-six torches.

FRANCE.

In Algeria the artillery and infantry reserve ammunition is carried by ammunition sections attached to the mountain batteries. Including the ordinary allowance of battery ammunition, there are with each battery one hundred and twenty boxes containing 780 shrapnel and 60 case shot and thirty-three boxes each containing 1,472 rounds of rifle ammunition and three boxes each containing 2,700 rounds of pistol ammunition. The total establishment of a battery including its ammunition section is 242 officers and men, 17 horses and 140 mules.

SPAIN.

An ammunition column constitutes in war an integral part of a regiment of six Mountain batteries. There are three regiments of Mountain Artillery, the Corps d'Elite of the Spanish Army. The war strength of an ammunition column is :—One captain, three lieutenants, one veterinary surgeon, seven sergeants, sixteen corporals, three trumpeters, one farrier, three wheelers, three collar-makers, three shoeing-smiths, three hundred and fifty-six gunners and two specialists, 5 officers' and 18 battery riding horses and 200 loaded mules carrying 144 boxes of artillery ammunition and 256 boxes of infantry ammunition. The number of rounds carried is 648 of shrapnel, 432 common shell, 72 case shot and 322,560 Mauser rifle cartridges. There are allotted thirty boxes also for the carriage of spare *matériel,* hospital and veterinary medicines and artificer's spare tools and spare harness. These, with six spare saddled and six spare unsaddled mules, brings the total number of mules in the column to 221. The Spanish Mountain Artillery is the oldest and most efficient in Europe and it was from our experience with it in 1837 that our pack saddlery equipment was devised in India by officers who had served in Spain at that period.

THE DUTCH COLONIES.

For the Dutch colonies in the East Indies, not only the ammunition of the mountain batteries, but also the second line of ammunition and certain stores and kits of the field batteries are carried on pack horses. The column for each battery comprises forty-eight portable ammunition boxes containing one hundred and forty-four ring shell, ninety-six shrapnel and forty-eight case shot, in charge of one European quarter-master sergeant, three native corporals and twenty-six native gunners, with one riding and twenty-four pack horses, and, with the stores and kits, one sergeant, one corporal and eleven gunners in charge of eleven pack horses.

GREAT BRITAIN.

The only suggestion for the formation of a pack ammunition column on our Imperial establishment was that put forward by Major W. L. White, R.A., in his prize essay twelve years ago,* and is here re-produced in the following table:—

PROPOSED ESTABLISHMENT REQUIRED FOR TWO ARTILLERY AND ONE INFANTRY AMMUNITION COLUMNS.

Staff.	Number.	Horses.	Establishment of Columns.	1st Artillery Column.	2nd Artillery Column.	Infantry.	Total.
Major...	1	1	Lieutenants	1	1	1	3 Officers.
Captain	1	1	Sergeants	2	2	2	195 N.C.O.'s and men.
Sergeant-Major ...	1	1	Corporals	2	2	2	
Battery Q.M.S. ...	1	1	Bombardiers ...	2	2	2	
O.S. conductor ...	1	1	Drivers	56	56	56	
Trumpeters	2	2	Wheelers	1	1	1	
Farrier	1	1	Collar makers ...	1	1	1	
Servants and drivers	12		Shoeing smiths ...	1	1	1	
Baggage mules ...	6		Mules				
			Ammunition... ...	86†	86†	86†	294 mules.
Total			Baggage and stores	12‡	12‡	12‡	
Officers	2		Horses.				
Men	18		Lieutenants	1	1	1	12 horses.
Mules...	6		Sergeants	2	2	2	
Horses	8		Collar makers ...	1	1	1	

Ammunition carried. §

Shell	Common	640.
	Shrapnel	1600.
	Case shot	320.
	Cartridges	2560.
	S.A.A. boxes of ammunition	160.

Now the *personnel* for these columns he proposed to take from the battery at home and the number of animals required in addition to the home establishment of the battery were to be obtained in the country in which the column was serving and driven by native drivers. But this scheme assumes that the battery at home on mobilization of these columns would not be required itself as a combatant unit; surely most improbable, unless it was proposed to employ only field batteries with all but their limber supply of ammunition in pack. This latter circumstance would surely be of rare occurrence.

It seems to me that it would be a sound system to organize at home in peace the nucleus of an ammunition column equal to the requirements of a brigade of all arms, of such strength as usually constitutes the convenient highest tactical unit in mountain or irregular warfare, viz:—

Four battalions of infantry
One mountain battery
Four machine guns
One squadron of cavalry (or one company of mounted infantry)
One section Royal Engineers.

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* "Mountain Artillery, its Organization, Equipment and Tactics," by Captain W. L. White, R.A., R.A.I. "Proceedings", Vol. XV. No. 9. 1887.

† Including eighteen spare (twelve saddled and six unsaddled).

‡ Including three spare (saddled).

§ Including proportion of tubes and fuzes.

The necessary details of a pack ammunition column for such a force in war is given in the appendix attached.

The mules and their drivers would usually be obtained in or near the theatre of operations.

Under certain circumstances it might be advisable to replace the mule by camel or carrier transport. The modifications could easily be arrived at by remembering that a unit load is that for a carrier, viz. forty-four pounds, and that the load (exclusive of saddlery) carried by one transport mule is equal to four carrier's loads and by a camel is equal to seven carrier's loads.

The peace portion of the column would consist of the depôt increment attached to the service Mountain Battery at home and be constituted a separate unit. In war it would be completed in men from the reserve.

APPENDIX.

Detail of Establishment Required by an Ammunition Column for a Brigade of all Arms (for Mountain or Irregular Warfare).

	Personnel.										Total Personnel.	Animals.		Total Animals.
	Military.							Civilian or Native						
	Officers.	Warrant Officers.	S. Sergts and Sergts	Artificers.	Rank and File.	Trumpeters.	Total.	Conductors	Muleteers	Total.		Cobs, Riding.	Mules, Pack.	
Captain.	1	...	...	...	...	...	4	...	...	...	4	1	...	1
Subalterns.	3	...	...	...	...	...		...	...	...		3	...	3
Sergeant-Major. ...	...	1	...	...	...	...	1	...	...	...	1	1	...	1
Battery Sergt.-Major.	...	...	1	...	...	...	6	...	...	...	6	1	...	1
Battery Q.-M.-Sergeant	...	...	1	...	...	...		...	...	...		1	...	1
Sergeants.	...	...	4	...	...	...		...	...	...		4	...	4
Sergeant-Farrier. ...	...	...	...	1	...	...		...	...	...	9	1	...	1
Shoeing Smiths. ...	...	...	...	3	...	...		...	...	...		1	...	1
Collar Makers. ...	...	...	...	3	...	...		...	...	...		...	...	...
Wheelers....	...	...	...	2	...	...		...	...	...		...	...	...
Corporals	...	...	...	...	4	...	47	...	...	...	47	...	...	...
Bombardiers. ...	...	...	...	...	4	...		...	...	...		...	...	...
Gunners.*	...	...	...	...	39	...		...	...	...		...	...	...
Trumpeters.... ...	...	...	...	...	...	2	2	...	...	...	2	2	...	2
Conductors.	...	...	...	...	...	...	...	3	...	3	3	...	...	...
Muleteers.	...	...	...	...	...	...	...	...	78	78	78	...	191	191
Spare.	...	...	...	...	...	...	...	...	...	...	...	1	18	19
Total.	4	1	6	9	47	2	69	3	78	81	150	16	209	225

* Calculated on the basis of one to every six laden mules, four servants and three spare. They are mainly required to place casualties in the battery.

DETAIL OF AMMUNITION REQUIRED BY AN AMMUNITION COLUMN FOR A BRIGADE OF ALL ARMS.

Detail.	Number of rounds.	Number of boxes.
ARTILLERY AMMUNITION FOR ONE MOUNTAIN BATTERY.		
Complete rounds of shrapnel at 50 °/o of amount carried by battery	216	36 (Artillery pack transport).
Complete rounds of ring shell at 50 °/o of amount carried by battery	72	
	288	
4 machine guns at 8,800 per gun	35,200	S.A.A.)
·303 RIFLE AMMUNITION.		
4 battalions infantry = 3,552 rifles × 77 ... =	273,504	250 (S.A.A.)
1 section R.E. = 36 " × 30 ... =	1,080	
	274,584	
Add for packing	416	
	275,000	
PISTOL AMMUNITION.		
1 squadron cavalry 18 pistols × 12 ... ... =	216	8 (Pistol S.A.)
1 Mountain Battery 10 " × 12 .. ... =	120	
1 section R.E. 13 " × 12 ... ... =	156	
4 battalions infantry 104 " × 12 ... ... =	1,248	
	1,740	
Add for packing	180	
	1,920	
·303 CARBINE AMMUNITION.		
*1 squadron cavalry 136 carbines × 25 ... =	3,400	4 (S.A.A.)
1 Mountain Battery 18 " × 25 ... =	720	
	4,120	
Add for packing	280	
	4,400	

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* In some countries mounted infantry would be used either in conjunction with or in lieu of cavalry and provision for transport of their ammunition be made accordingly, as follows:—One company of 123 rifles requires 6,886 rounds; or less for packing 286 = six boxes = three mules.

SUMMARY OF PACK TRANSPORT FOR AN AMMUNITION COLUMN FOR A BRIGADE OF ALL ARMS.

Nature of load.	Number of mules.	Number of muleteers
36 boxes artillery ammunition	18	9*
32 " machine gun ammunition	16	6
4 " carbine ammunition	2	
250 " rifle ammunition	125	42
8 " pistol ammunition	1	
1 artillery carriage Mountain spare (without axle and wheels)	2	1
1 Mountain forge	1	1
1 pair charcoal bags	1	
1 " veterinary boxes	1	
1 " office boxes	1	1
1 " Quarter-Master-Sergeants store boxes ...	1	
1 " " " valise ...	1	
3 " artificers boxes	3	1
Officers' baggage and mess	3	1
Kits of 65 N.C.O.'s and men †	9	3
Cooking utensils and rations	2	2
Water	3	
Entrenching tools	1	
	6‡	2
	12§	9 including 5 spare.
Total	209	78

* The calculation of muleteers is made out on the basis of one to every three mules, except for the artillery ammunition, which is carried in artillery pack boxes on ordnance saddles, is heavy and requires ordnance mules for its transport, so one muleteer to every two mules is allowed, as also for the two artillery carriages and relief mules.

† Kits of muleteers and mules stable gear are carried distributed as convenient on the top of saddle of mules carrying S.A.A. boxes.

‡ Spare saddled.

§ Spare unsaddled.

The driver establishment of the Mountain Battery in Natal should, in my opinion, be similar to that of the batteries in India, a more economical and efficient arrangement than "Cape Boys." No. 16 Co., S.D.R.A., on transfer in the autumn to Egypt, should become a permanent Mountain Battery, with an armament similar to that of the Egyptian Mountain Batteries, and an Egyptian driver establishment. It would then be available for service in Abyssinia or elsewhere if required.

ARTILLERY AMMUNITION SUPPLY.

BY

LIEUTENANT B. ATKINSON, R.H.A.

IN the few articles which have appeared in this country on the desirability of the quick-firing gun as a weapon for artillery in the field, the question of ammunition supply has received but scant attention. This is particularly noticeable in the essays written for the Duncan Gold Medal, 1898,* and is the more to be wondered at in that this most important subject presents to us a two-fold problem.

(*a.*) Is more ammunition necessary?

(*b.*) If so, to what extent and in what manner are we to increase our supply?

With regard to the first part of the problem, the general idea would appear to be that in future the rate of fire will be greatly accelerated, and that therefore our present supply will soon be exhausted. With the exception of Major H. W. W. Barlow, most of the writers appear to somewhat over-estimate the uses of rapid fire, which is of course only intended for the more critical moments of the fight, and would thus prove the exception rather than the rule.

For as far as we can tell, the change of weapon will not necessarily imply a change of targets. These will probably remain the same for the quick-firing—as for the present field gun. Given equally accurate laying and service of the gun, the same if not indeed a smaller number of rounds will be required for their annihilation, and the only difference will be the period of time required for the attainment of this object.

Though in these times of swiftly following changes the campaigns of recent years are no criterion, yet they furnish many interesting statistics, of which the following may be found worthy of notice. They are for the most part taken from General Wille's "Feldgeschütz der Zukunft."

Until the Franco-Prussian war, the only instance of a battery firing on a single day more than the amount of ammunition carried with it is that of an Austrian 4-pr. battery at the battle of Königgratz. This battery fired 217 rounds per gun, or 139% of its ammunition. During the war of 1870, notwithstanding the numerous severe battles of the campaign and the consequently heavy calls on the artillery, the 1,344 German guns fired an average of only 199 rounds a-piece, or somewhat less than 1½ times the amount of ammunition carried with the batteries. The light batteries of the Prussian Field Artillery fired no more than 122%, the Horse Artillery 134%, and the nine c.m. batteries 153% of the ammunition carried with them.

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* R.A.I. "Proceedings," Vol. XXV., No. 7, 1898.

The greatest amounts fired on any single day were :—

A Horse Artillery battery at Vionville fired 194 rounds per gun, or 124% of its ammunition.

A light Field battery at Vionville fired 173·6 rounds per gun, or 111% of its ammunition.

A nine c.m. Field battery at Vionville fired 154·2 rounds per gun, or 116% of its ammunition.

More than the amount of ammunition carried was fired by 22% of the batteries at Vionville, *by only* 3% of the batteries at Gravelotte, and by *no* battery at Sedan. Moreover, in the two first mentioned battles the necessary ammunition could have been obtained from the neighbouring batteries without falling back on the columns.

In considering these figures we must also bear in mind the following facts. That any unusually large expediture of ammunition invariably occurs in the more important engagements. In fact, generally speaking, the number of rounds fired per gun may be said to vary directly with the strength of the forces engaged. That the larger the battle, the slower is its development, and now that smokeless powder has been universally adopted, this condition of things will be even more prevalent in future. On these grounds we may take it for granted that the ammunition columns will generally be close at hand when required, and furthermore these columns would have more than met any demand made on them up to the present time. Again, the system of ranging was vastly inferior to that of the present day and therefore more rounds were necessary to produce decisive results. Lastly (and this is perhaps the most important of all), we must remember that, as Major Barlow tells us in his very able essay,* the only projectile successfully used was the common shell employed by the Germans.

Now unless we have greatly over-estimated the power of our modern ammunition, less than half the foregoing numbers of shrapnel would have sufficed to bring about the same results. Should this moderate estimate be wide of the mark, then, as Major Barlow recommends, it is high time that we should seriously consider the desirability of reverting to some form of common or segment shell. In conclusion it is hard to refrain from quoting once again the Okehampton Commandants remark, " nor need rapidity of fire mean expediture of ammunition, . . . ".

Could we but rely on the foregoing figures, any important increase of ammunition would appear superfluous. But alas ! so swiftly do the times move that campaigns dating not further than twenty years back may be regarded as ancient history. It therefore behoves us to endeavour to solve the second portion of the problem, namely—to what extent and in what manner are we to increase our supply of ammunition ? Of the successful essayists, Lieut.-Colonel Elmslie alone suggests a method.† After a preamble over the war of 1870, he admits that it "appears possible that for any given object fewer rounds will be required to produce decisive results than before." Yet in his very next sentence he goes on to say, "but the batteries will not permit themselves to remain idle, and therefore more rounds will certainly be used in the day's work than with slow firing equipments." Now the present writer must confess that he is unable to follow this argument.

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* " Advantages and Disadvantages of Q.F guns for Artillery in the field," by Captain H. W. Barlow, R.A. R.A.I. " Proceedings ", Vol. XXV., No. 7, 1898.

† Idem., by Major F. B. Elmslie, R.A. Ibid.

Though the necessary decisive results have been obtained with, if anything, a smaller number of rounds than has been the case hitherto, yet, as we see later on, Lieut.-Colonel Elmslie conjectures that the total expenditure will be *doubled.* How is so large a difference to be accounted for? For more than a half of the total expenditure of ammunition is surely an extravagant amount to allow for other than decisive issues. Possibly however, to use a German expression, the detachments have been "shooting in courage." Lieut.-Colonel Elmslie then proceeds to take the infantry as a basis, and decides that the artillery ammunition supply must be doubled. In making this demand he appears to attribute the increased infantry supply entirely to the adoption of the magazine. While confessing to ignorance on matters concerning the sister arm, the present writer would venture to suggest that, taking into consideration the decreased weight of the magazine bullet, this increase may be partly due to the ability of the *personnel* and wagons to carry more ammunition rather than to the necessity of their doing so.

To proceed however, Lieut.-Colonel Elmslie proposes to carry about 3,500 rounds per battery, and distributes them as follows:—

Battery	1,000 rounds.
Ammunition column	1,000 "
" park ...	1,500 "

In other words, he adds wagons to his battery, doubles the size of the ammunition column, and more than trebles that of the ammunition park.

With the first portion of this programme no fault can be found. If extra ammunition must be carried, which however the present writer does not admit, by all means let it be placed where it is in the best position to meet any sudden or excessive demand made on the battery. But the doubling of the ammunition column is quite another question. Lieut.-Colonel Elmslie proposes to effect this by the formation of "light and mobile units, well officered, and capable of moving at good speed across country."

Has Lieut.-Colonel Elmslie considered how much ammunition light and mobile vehicles will carry across country with safety? It is to be hoped that a goodly number of qualified wheelers will accompany these columns. But, even granted that such a vehicle were procurable, let us for a moment pause and consider the difficulties in the way of the unfortunate column commander. Even should the "stringent regulations" clear a way for him, and in war time this would be very doubtful, he finds himself behind large bodies of troops, which, were they ever so willing, in many cases could not give him a clear road. He has received no orders from his brigade division commander, and is in an unknown country. You may see him in your mind's eye, galloping madly to and fro in search of the lost legion, and shedding wagons in every field. No, let the ammunition column remain as before, larger if unavoidable, and let the stringent regulations apply to it.

With regard to the ammunition park little need be said. It is unwieldly now and would be more so in future. But one word of sympathy must be given to those "pairs of heavy horses" which, in the absence of motors, are to draw the additional wagons. Had Lieut.-Colonel Elmslie seen the condition of the baggage column horses at Salisbury last year he would certainly share that sentiment. However he was better employed.

Though in the writers humble opinion, a large increase of ammunition is undesirable, we may possibly find ourselves able to steer between the *Scylla* of Lieut.-Colonel Elmslie's suggestion and the *Charybdis* of no increase. A certain addition might be obtained without any insurmountable difficulty. It might be partially effected by an improved construction of vehicles, by which of late years the amount of ammunition carried has been raised from 30 to about 50% of the total dead weight. The experimental carriages of the Paris Nordenfelt Company carry no less than 51%. Our present limbers carry about 36% and our wagons 37% of the dead weight. We may also, as Lieut.-Colonel Elmslie proposes, follow the example of our powerful neighbours and add either two or three wagons to each battery. This with two additional wagons would give us 179 rounds per gun for field and 167 per gun for horse artillery. With three wagons, 196 rounds per gun for field and 182 for horse artillery, figures which are never likely to be exceeded. By this means our increased supply would be located where it is most wanted, and we could congratulate ourselves on having placed no further difficulties in the way of the "lumbering unwieldly ammunition column, wearily dragging its slow length along the roads."

THE BORDERLAND OF CHEMISTRY AND ELECTRICITY.

BY

W. WEBSTER, ESQ., F.C.S.

(*A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday 24th Nov., 1898*)

COLONEL H. S. S. WATKIN, C.B. R.A., IN THE CHAIR.

THE CHAIRMAN :—Ladies and Gentlemen, I need hardly introduce the Lecturer, for I feel sure that most of you present here this evening were at his last lecture, in which he brought us, by showing us the most unique experiments, quite up-to-date in the "X Rays". To-night we are going to be brought into contact, not only with Electricity but with Chemistry, which, according to Sir William Crookes, we shall be most indebted to in future; and I feel sure we shall have a most interesting and instructive lecture (applause).

Mr. WEBSTER :—Colonel Watkin, Ladies and Gentlemen, the title of my lecture 'The Borderland of Chemistry and Electricity' is one that is ambiguous. The subject itself cannot be condensed, nor would twenty lectures suffice to exhaust this wonderful 'Borderland'. So many theoretical and practical demonstrations are connected even with one section of it that I very much doubt whether any audience would listen to the various theories that have been advanced within the last few years. The "Borderland" of these two sections of science means the results obtained first by chemical action, or the combination of two or more bodies forming an entirely new body, and which in the process of the combination develops a force called electricity; and the action of the force called electricity, which produces a combination of bodies so as to form entirely new bodies. Between these two forces, electricity and chemical action—there is something else, which "something else" is purely theoretical at present, but undoubtedly it points to certain actions which may in the future lead us to form opinions and find proofs of what "life" is.

Chemistry was originally practised as alchemy, which was really the artificial production of the noble metals. From all sources obtainable Egypt seems to have been the country in which it was first practised, the old name of this country being "Chemia," which means in all probability mysterious or secret knowledge. Now anything that is mysterious or secret you may be perfectly certain is not true. The alchemists devoted their energies to the discovery of the philosopher's stone.

Aristotle developed a doctrine of the four elements—earth, water, air or steam, and fire; earth meant dryness and coldness; water—coldness and wetness; air or steam—wetness and heat; fire—dryness and heat. He supposed matter to be of one kind, the difference of material he supposed to be due to the greater or less amount of the four conditions which were supposed to be necessary to all substances. It had nothing to do with what we now know as chemical composition.

Pliny believed in the formation of water from air, which he deduced from the fact of the formation from the disappearance of clouds. He thought rock crystal was produced from moisture, being, in fact a kind of ice. The question of the change of the base into the noble metals was considered to be an open question. The Byzantine philosophers of the fourth century first used the word "Chemia" as the name of the process which was used for the creation of gold and silver.

Plutarch mentions that the old name for Egypt was "Chemia," which was given to it on account of the black colour of its soil. The same word means the black of the eye, and also dark and mysterious.

Aristotle's philosophy extended to the Arabs, who in 1640 overran Egypt and northern Africa into Spain. Their alchemic education was undoubtedly obtained in Egypt, and by prefixing the Arabic article to "Chemia," they arrived at the word "Alchemy." A celebrated Arab named Geber undoubtedly wrote the oldest books known connected with this science, and they have been handed down through Latin translations. He actually describes chemical operations, filtration, distillation, crystallisation and sublimation, with which actions he prepared new substances, and purified the originals. He used alum, green vitrol, saltpetre and sal ammoniac. He manufactuerd nitric acid or *aqua fortis*, and from it the solvent of gold known as *aqua regia*, which is a mixture of nitric and hydrochloric acids. If he prepared nitric acid then he undoubtedly knew what sulphuric acid was. He also had knowledge of mercuric oxide and corrosive sublimate. Unfortunately he thought that the differences between metals were due to changing quantities of mercury and sulphur, of which he supposed all metals were composed.

Under Arab teachers the Spanish schools were thronged with students from all parts of the so-called Christian world. In Spain lived Raymund Lully, in France, Arnold Villanovanus, in Germany, Albertus Magnus. Roger Bacon (thirteenth century) was an alchemist, and he was tried for sorcery at Oxford. He thereupon wrote a celebrated book in which he described so-called supernatural appearances as being due to natural causes. His defence was so convincing that he was acquitted. It is a pity that in these days vendors of quack medicines cannot be brought before courts of law, as I very much doubt whether they would be acquitted of nefarious practices and deceit.

In the fifteenth century chemical facts were increasing, but the old idea of what matter was, still held good. During this period medical chemistry began, various investigators being in search of the "Elixir of life," as a remedy for all disease. Basil Valentine describes the medical values of many of his compounds; in his works the properties of antimony compounds were so well given that even at the beginning of this century they had not been improved on. At the beginning of the seventeenth century the same author proved that galena contained sulphur, and iron pyrites gold. Even so late as 1709 Homburg stated that pure silver melted with pyrites contained gold; other investigators meeting with similar results, it was supposed that pure silver *did* contain gold.

Paracelsus (fifteenth century) discovered the link between chemistry and medicine, but he still held the transmutation of metals to be possible. Van Helmont (sixteenth and seventeenth centuries) was the first to upset the Aristotle theory of the four elements, and described fire as a force, not a material; he denied that earth was an element; he was also the first to use the term gas; his gas sylvestre was clearly shown to be different from the atmosphere, as he found it to be produced during fermentation, and also during combustion, and stated that it was present in the Grotto del Cane at Naples; he also mentioned a gas evolved from manure and decaying organic matter, which was inflammable, as against his gas sylvestre, which was not inflammable; the inflammable gas would be sulphuretted hydrogen, the gas sylvestre carbonic acid.

Lemery (1675) first showed the distinction between inorganic and organic chemistry. Robert Boyle (1627–1691) overthrew Aristotle's doctrine as well as that of Paracelsus; his book was entitled *The Sceptical Chemist, or Chemico-physical Doubts and Paradoxes touching the experiments whereby Spagyrists are wont to endeavour to evince their salt sulphur and mercury to be the true principles of things.* The first edition was published in 1661; he was the first true scientific chemist and began a chapter of science, the aim of present scientists, which may be named the simple advancement of knowledge by the observation of facts; it was he who wrote "*On the Borderland of Chemistry and Physics,*" in his experiments and investigations on the elasticity of the air he discovered the great law which exists between volumes of gases and the pressures to which they are subjected, and which still bears his name, known as Boyle's Law.

Hooke (1665) and John Mayon (1681) wrote pamphlets on combustion which were more accurate than numerous other subsequent attempts; these two philosophers observed that when metals were calcined they increased in weight, which they pointed out as due to a certain spirituous nitro-aerius, another name for what we now call oxygen. Mayon undoubtedly proved that air was a mixed compound, for he stated that when a portion of it was absorbed by the process of calcination an inactive gas remained, and came to the conclusion that the act of breathing and combustion were allied phenomena.

Stahl first evolutionised the name Phlogiston; this Phlogiston, given off by combustion, he found to be taken up by living plants; and he supposed that the phenomena of fermentation and decay were due to a loss of Phlogiston; between the announcement of the Phlogistic theories and its complete disestablishment by Lavoisier, the science was built up by Black, Priestley and Cavendish.

Black (1754) shook the foundation of the Phlogiston theory and was the first to bring forth Quantitative Chemistry, as he introduced the balance or scales, an instrument absolutely necessary for all chemical science and research; Black showed that the effervescence produced when *magnesia alba* or carbonate of magnesia was acted on by an acid resulted in the loss of weight of the original materials, viz. by adding a given weight of acid to a given weight of this *magnesia alba* or carbonate of magnesia a gas is given off. On re-weighing the compound formed by the two materials it is easily seen that the resultant weight is less than the original weights of the two materials before mixture.

Priestley, in 1772, examined the chemistry of the burning of candles, and the breathing of animals upon air; he then found that living plants placed in the gas vitiated by the breathing of animals or the combustion of a candle reconverted the deteriorated air to its original property, viz., of again supporting the combustion of a candle; by this simple experiment the world was first taught the absolute necessity of growing plants and trees as a means of purifying air rendered noxious by animal life, and the fires and lights of the habitations of men. Without this natural purifying process the air would become incapable of supporting life, and universal death to life as we know it must slowly and surely come; the gases producing this deleterious effect are known as carbonic acid and carbonic oxide. It must be remembered that the atmosphere of our world is not inexhaustible, and if the balance of nature is upset by man, so that with his many inventions necessitating the enormous consumption of the oxygen of the air for the purpose of producing the necessary requirements of heat and combustion, oxygen will become so scarce that animal life, and for the matter of that vegetable life, will cease to exist. It is therefore necessary to take care that the balance so beautifully adjusted by nature should not be destroyed by man's rapacious worship of the golden calf, for the chief cause of the vitiation of the atmosphere is due to the piling-up of wealth. To stop this, chemical and physical knowledge may in future ages so evolutionise that the natural force of nature will be used for producing heat, light, and power, instead of the artificial force now used by man. To cheapen coal gas, water gas is now added; carbonic oxide is thus added to atmospheres of our rooms, producing headache, giddiness and fainting, even when present in minute quantities. I have also detected Fluorine compounds in the atmosphere of manufacturing rooms. Is it true that bone manure manufacturers use large amounts of natural fluorides? The gases driven off from these compounds by heat and wind reactions, vitiate the atmosphere and are present in the form of hydrofluoric acid. A drop of this acid burns the skin like red-hot iron and when present in air, even in infinitesimal amount, acts on respiratory organs most deleteriously, inflammation of *Mucous membrane* is developed, rise of temperature naturally takes place, with general symptons like influenza.

The transmutation of metals or the artificial production of gold is a fraudulent science supposed to be non-existent, but it was only the other day that an individual in America made the announcement that he could turn Mexican silver dollars into gold; he was a gentleman well known in England a few years back. It is a strange fact that our daily press had so much to say in its favour; granted it may have been copied from American papers, but surely the education of those who write for the press should teach them better. Young people nowadays are educated or should be educated as observers of facts, and that education should include the study of electricity, chemistry and physics; it would prevent superstition and humbug from producing disastrous effects on human intellects, and stop fraud. In the future, if our children's children are to obtain a living, they must undoubtedly be so educated that they can apply their scientific training to the common wants of life.

Cavendish was contemporary with Priestley, and his investigations from a strictly intellectual point of view were most important, for he was the first to determine the specific gravity of gases; he took notes on the alterations of volume due to changes of pressure as the temperature varied, and he also proved that by using a given weight of each of certain metals that the same volume of gas could be obtained, no matter what acids were employed to dissolve them, and he found that equal weights of metals gave unequal volumes of gas, a proof of the different atomic weights and the different affinities of the metals for the various acids.

Dalton, in 1803, proved that the relative atomic weights of elements are the proportions by weight in which the elements combine; he gave the first table of atomic weights; he made known the action of oxidation, which rendered possible the production of a force by chemical action and which we know as electricity; a somewhat mysterious force which even at the present time is not completely understood.

In 1828, Wohler discovered chemicals which were thought up to that time to have been merely the product of animal life, and broke down the barrier between organic and inorganic or mineral chemistry the first proof that the science of physiology was the chemistry and physics of the living body.

Berzelius by his analyses proved that organic compounds had the same laws as inorganic compounds; the combination of two bodies, inorganic or organic, do as we now know, evolutionise a force, as there is a rise of temperature. This chemical action may produce heat, gradual or immediate, variation being due to the affinities which bodies have for each other; this history is somewhat dry but it is important, and it shows to what a very large extent chemistry took its rise in this country.

If I add sulphuric acid to water a considerable rise in temperature takes place, and we become aware that these two bodies have strong affinities for each other; knowing this I will pour some sugar and water known as syrup into this small glass, and I now add some sulphuric acid, and stir with a glass rod so as to intimately mix the two solutions; sugar consists, roughly speaking, of carbon and water; the sulphuric acid combines with the water and leaves the carbon, the original syrup changing into a semi-solid mass of black carbon or charcoal—(making the experiment)—you can all now clearly see that chemical action has taken place and a carbon block appears—(applause)—this brings us nearer to electricity produced by chemical action, for if this carbon is well washed in water, freed from acid contamination, filtered and pressed into a plate, it will be useful as the positive pole of a primary battery; so that this very old experiment, as old as chemistry itself in all probability, though very seldom shown is really one of some importance.

The production of carbon is generally associated in the common or garden mind with the burning of wood, which of course produces heat and light, but with the experiment just completed very great heat has been developed, but no light. Hence carbon can be produced at a heat somewhere about the temperature of boiling-water provided the chemicals used are in solution.

I will now pour some sulphuric acid upon a pile of lump sugar, the sugar having, of course, only what is known as the water of crystallisation in its composition—(making the experiment)—the sugar you will notice, is turning a yellow colour, it is now brown, now chocolate, now black. The sweetness has gone, its chemical composition has been changed, and carbon produced—(applause)—with a solid and a liquid mixed at normal temperature great heat has been produced in this change, but no light or visible combustion.

The next experiment is interesting. I have here some powdered chlorate of potass lozenges, which as you know, consist of sugar and chlorate of potass. I place it on this small dish and to it I add one drop of sulphuric acid. The rise of temperature is so immediate and so great that it is sufficient to produce visible combustion, that is heat and light—(making the experiment)—you see now that the whole mass burns, and that the light produced is most intense—(applause)—now if I had placed a carbon plate on the top of this burning mass, and had connected the plate with a galvanometer, and connected the zinc plate upon which the mass was burning also to the galvanometer, the one to the positive and the other to the negative terminal, you would have seen the needle of the galvanometer violently agitated and rotating rapidly. The heat produced by the chemical action produces something else, one might say calls it into life or action; that 'something else' being a vibration communicates its vibration to the wires attached to the galvanometer, and the vibration assumes visible motion in the needle, and that motion is the resultant of the force called electricity. I cannot show the experiment in so large a room with my apparatus, as the galvanometer is not large enough for everyone to see. But with the galvanometer I have it is possible with the heat of the hand only to produce a sufficient current to cause the needle to rotate.

Now if chemical action produced by organic or inorganic mixtures gives electricity, then the chemical action constantly taking place in our bodies must produce the same force, namely electricity, which can be seen and tested in that fish known as the Electric Eel. How or in what way this animal is able to store a force so that at will it can, when disturbed, give a considerable shock to any person touching it, is not I believe, very well understood. But there is the practical demonstration.

Chemical action produces heat in our bodies, most undoubtedly by the process of digestion of food, for without that food, life, as we know it, ceases to exist for want of proper nutrition of the body—then the body, with its various bones, muscles, nerves, is fairly well represented by the steam-engine. The combustion of fuel necessary to produce the heat for raising the temperature of the water so that steam at certain pressures shall be given off, and so act on valves arranged to produce power, which we can see at any time on examining a locomotive which produces inorganic motion similar to the organic motion of animals. The stomach of the animal represents the furnace, the blood circulating represents the steam and water in tubular boilers, and the various limbs and motions of the body the motions of the driving-wheels of the engine. As the digestive organs are more or less impaired they do not receive the results of a proper chemical action or combustion, although there is no visible heat, still we know it is there by testing the heat produced in the body by means of thermometers, this combustion due to silent digestive action more or less complete causes robust or feeble health. Doctors may possibly be able, if in time, to induce a proper heat-giving action; of course the action is complicated, but the fundamental principle is the same. A new start, by means of drugs, change of diet, and even change of air, may be induced, but it all means the same thing. Drugs—chemical action; proper diet—chemical action; change of air—chemical action; for change of air means a purer atmosphere and a quickened oxidation of the blood produced through the medium of the lungs by respiration. This chemical action in the body must produce electricity, for it is well known and well proved that chemical action is always co-existent with electrical action.

There is a pamphlet written by a French scientist who described his experiments connected with animal electricity. I have seen it quoted, and I believe if my recollection of this matter is correct, that the experiments took the form of measuring the electric current produced by the motion of muscles, such as fingers, arms, legs. I am told that jerky, excitable people have more electrical affinities in them than those who are very slow and plodding. I have noticed this in subjects receiving electric shocks from a coil.

More than one witness of the following curious phenomena has vouched for their accuracy. Certain men during the severe winters in various parts of Canada and North America have demonstrated for the amusement of their friends the fact of being able to light a gas-jet with their fingers without any electrical appliance; it was in each case done before friends who had a knowledge of electricity. The towns in which I am told they took place were on high plateaus. In one case the experimentalist simply slid across a well waxed floor in his slippers; arriving at the end of the room near the gas-jet turned on, and immediately placing his finger above the jet, to the astonishment of the witnesses the gas was lighted. I confess that even in this last case I cannot understand the phenomenon, for although it is a common experiment to light a gas-jet by allowing your body to become charged from either a coil or frictional machine, still your body has to be insulated in that case on a glass stool; where the electricity comes in when you are not insulated is a matter of considerable doubt. In the face of the evidence I had given to me it was almost impossible not to believe, but in the face of the fact of the Electric Eel it may be possible surrounding conditions being favourable, for a human being to become charged with electricity. It is undoubtedly a fact that some people's hair when combed with a vulcanite comb produces sparks in the dark; and of course a cat, having a very dry skin, when rubbed violently in a dark room even with the hand exhibits the same electric condition. From this knowledge a cat skin is very often used as an exciting medium for frictional electricity; in any case, if human subjects have exhibited electrical phenomena, then their skins must be abnormally thick and dry.

Starch granules produced in vegetables or plants are of course regenerations of the carbon in the ground in which they are growing. Artificially you can turn these granules into sugar, and by still further action, as I have just shown, that sugar again becomes carbon.

Beginning with heat you end with heat, for to drive the dynamo you start its motion by means of the furnace of the engine necessary to produce motive power, and you end with heat in the so-called electric light. Co-existing with this you start with chemical action and you end with chemical action, the heat and light of the chemical action being turned into electricity, the vibration communicates its action to the molecules of the metal wires necessary to convey the current to the carbons of the electric lamp. In my lectures, at Dover and Shoeburyness, in 1896, I mentioned a common experiment with electrodes in acidulated water; to use a current of such an E.M.F. that short circuit between electrodes takes place. One then sees a vibrating line of electric molecules develope heat and light in the liquid.

Chemical action is in itself a vibration, heat is vibration, light is vibration, electricity is vibration, sound is vibration—the telephone converting it into electricity, which is conveyed by wires to another telephone which reproduces the sound. Beginning with heat you end with heat; therefore if you are born in a warm climate you may end in a warm climate. (Laughter.) When certain finely divided metals are thrown into the atmosphere, combustion or oxidation takes place. The aerolites and meteorites coming into contact with our atmosphere become visible owing to the great heat generated by friction against the molecules of air.

Sir Robert Ball states that a meteorite which burst 185 miles above the surface of the earth and produced a sound which was heard over a district in America nearly as large as the United Kingdom was probably not much larger than an ordinary billiard ball. It was travelling, as far as can be computed, between fifty and sixty miles a second; the vibration in the molecules of this body became so great that it evidently reached something beyond heat, and I suggest that possibly the action might be described as sudden electrical disintegration of a solid body into cosmic dust—the dust that exists in a vacuum tube and which is visible as radiant matter, which after long action deposits itself on the interior surface of the glass like a mirror.

Suppose this piece of iron I hold in my hand were to suddenly disintegrate in the way that small heavenly body did; the enormous force generated would turn this audience and the building itself into microscopical dust. It is reckoned that to produce the same explosive force and sound as the aerolite, several million pounds of dynamite would be required; I need hardly say that no gun was ever manufactured that could project even a bullet at the rate at which this small tramp of the heavens was travelling.

The following little experiment but poorly shows the phenomena of light and heat produced by friction in the atmosphere; I pour a little mixture of bisulphide of carbon and phosphorus on to this paper, and by waving it in the atmosphere it catches fire—(applause)—It has been suggested that this mixture was probably used by the ancient Greeks, and that it is identical with what was known as 'Greek fire.'

By allowing hydrogen gas to impinge upon spongy platinum, heat and light are produced by means of the friction of the gas on the molecules of the metal; this apparatus that I have here is known as the 'Philosopher's Lamp.' The hydrogen is produced as you see by the action of sulphuric acid and water on zinc, and on allowing the resultant gas to impinge on this piece of platinum contained in the small copper box it immediately becomes red-hot, and the hydrogen catches fire—(applause)—This kind of apparatus was used some thirty years back amongst a certain set of naval men, and assumed this form as it was treated as a scientific toy and utilised for lighting cigars; it is a curious fact that the last patent taken out for the incandescent gas-light for automatic lighting is an apparatus of a similar kind, coal gas taking the place of the hydrogen for producing the necessary heat for lighting the burner.

We have thus obtained heat and light in various simple ways from chemical action; there is a mysterious something apart from the resulting force of electricity without which it is supposed no action could take place, and it is called 'ether.'

At one time in the history of our earth the whole of the water existing as seas, lakes, rivers, etc., was gaseous, and the whole of the material that forms the solid portion of our globe was also gaseous. It was a condition that existed many millions of years ago, and we might say that as it was a long time back we hope it was not true; as a matter of fact that condition must have existed.

The earth is a cooling body, and the latest discoveries in astronomy go to prove that there are possibly worlds other than ours and that stars and suns exist in myriads. Photography has just proved that the various heavenly bodies we see at night with our eyes are not one-millionth part of those which can be photographed on the bromide film. Photographs show that in space surrounding our earth there is a perfect wall of suns interspersed with less-lighted bodies and with dark bodies—dark bodies that even the most powerful telescope fail to show to the human eye; but telescopic photography tends to show that as space has no beginning and no end so material matter has no beginning and no end. The human mind cannot grasp the fact, but as our lives are finite, and as our bodies are ruled by our brains, our brain cannot vibrate to the term infinite; for thought is vibration. Our poor idea and invention called 'Time' has only to do with a daily spinning-round of our earth and its motion round the sun. Life, as we know it, has only existed upon the earth for an infinitesimal amount of time compared with its history, and if the deductions by actual experiment and observation of modern scientists are not counter-balanced by some other law which has still to be discovered, then in the progess of time the earth will become—it may be millions of years, it may be hundreds of thousands of years only—like our moon, a solid inactive body, which in the process of cooling will have no atmosphere, no water, no life. If the sun is cooling, and this great receptive body is gradually losing heat, light and electrical giving properties, and our planet is getting nearer to it, still the same must come—the zero of cold. After Professor Dewar's experiments and extraordinary results by the liquefaction of air and even hydrogen it does not seem improbable that at some future period, it may be millions of years hence, the atmosphere itself will be liquefied and may form lakes of oxygen and nitrogen.

In reference to chemistry and its wonderful evolution, who would have imagined, even a few years ago, that the fruit essences with which you flavour your puddings are in many cases made in Germany from coal-tar products. The very scents that you use are dissolved essential oils manufactured from the same source; and the very photographic chemicals commonly used are also obtained from the same material. The scents are in some cases mixed with deodorized methylated spirit; and it is unfortunately only too true in this country that certain of its inhabitants, chiefly of the female sex, are in the habit of imbibing these scents, notably Eau de Cologne. I need hardly point out that even with pure spirit the essential oils used with the spirit have undoubtedly driven people mad, and with methylated spirit there could be but one end, and that is absolute dementia.

Then again, whisky sometimes consists of a mixture of the real spirit fusel-oil, and deodorized methylated spirit or crude German potato spirit. I need again hardly mention the terrible ravages that drink, impure and poisonous, is making amongst the inhabitants of this country. Unfortunately, I have a large personal experience as to its common abuse amongst those I have known in past years, and even at the present time. Dipsomania is on the increase, and it is to be hoped that the new law lately introduced will lead up to a still more stringent law, and that is, that those whose abuse of alcohol produces incipient madness and an utter want of control of themselves as civilised beings shall be compelled on the certificates of medical men to enter homes where they would be taken care of as individuals suffering from mania.

It is more than possible that impure spirit is the initial cause of sarcoma of the liver and most certainly kidney diseases.

Everything in the history of the evolution of the human race points to a better condition of life since science has been applied to the wants of man. Life has constant change or regeneration; two men who have not met for several years meet each other under the impression that they are individually the same. They are not; they have been entirely regenerated and renewed, I will speak in a very plain manner. They have absolutely been swallowing themselves, for if their saliva is examined microscopically you will find the dead cells of their bodies, which they are constantly swallowing and digesting. The constant washings of their bodies washes away the outside cells, and the very perspiration exudes the rejected cells from the living. Their very bones have been changed, for without this constant change and regeneration, renewal of matter and rejection of dead matter, life could not go on; and when the time comes in man's history when this regeneration and active change become slower and still slower, calcareous deposits take the place of the old cells, man becomes stiff in his joints, his muscles do not act, his nerves become coagulated, and regeneration for the time being ceases. Sleep or rest of the necessary actions for sustaining life takes place, and this is called death; but as whatever we start with must go on, so it seems to me that if we start with life then we must end with life. Death is merely a form of regeneration of the portion of that great 'ether' which permeates space and all things, and may be called Eternal Life.

Intimately related to this so-called 'ether' (a very poor term) we have electricity. Visible electricity has of course long been known to man as lightning and the aurora borealis, but its experimental and artificial production was in all probability first known to the Egyptian priests, who were the most scurvy set of fraudulent rascals that were ever evolutionised from the human race. But everything in science seems to have emanated from Egypt; this was possibly due to the many curious natural phenomena that exist in different parts of that country.

I remember reading some years ago the account given by a French scientist of his curious electrical experience on the top of one of the pyramids; it was an uncommon phenomenon, for it took the shape of a tongue of electrical flame appearing on the top of his hat, on raising his hand higher than his head and hat the flame appeared at the extremities of his fingers. The Arabs who accompanied him seem to have fallen down on their knees under the impression that he was a new prophet, but he very sensibly demonstrated the fact to them that it was not due to himself but to the peculiar electrical condition of the atmosphere.

The Egyptians with their magic spread over Europe, in all probability the true 'gipsy' is the descendant of the ancient Egyptian. Hypnotism was known to them, as it was undoubtedly known to other Easterns.

If thought is vibration then it explains that peculiar branch of science called 'telepathy' (which Sir William Crookes spoke about the other day in his presidential address to the British Association) and similar to wireless telegraphy in its action; it is by no means uncommon for two individuals to think of the same thing at the same time. I have seen experiments myself of what is known as thought transference with remarkable results obtained practically. Sir William Crookes has evidently tested it.

As to the history of the artificial production of electricity, it was known to the Greeks, long before Christ, that when amber was rubbed with silk it acquired the property of attracting light bodies, and it is incredible that it was not until the end of the 16th century that Dr. Gilbert, physician to Queen Elizabeth, showed that this property was not limited to amber. I am by no means certain whether this interregnum was an absolute fact, because many things practised by the Egyptian priests point to a more advanced electrical knowledge than the mere rubbing of amber. Practically, for hundreds of years nothing was done with it, nor in fact, with other branches of science. This was chiefly due to persecution instituted by the ignorant priests of the various religions; and it is with sorrow one reads that the professors of Christianity were the chief persecutors of those who thought for themselves.

Incredible as it may appear, Germany, the most scientific and advanced country as regards education, had during the fourteenth century a mad wave of persecution, for over 100,000 people during that cycle of time were burnt alive because they dared to think for themselves.

In this country we were not quite so bad in persecuting thinkers, but that may account for the fact that, where great persecution takes place of any particular set of thinkers, those thinkers ultimately spread their belief amongst succeeding generations, until those who have adopted the belief out number those who differ from them. Nowadays the large majority of people think for themselves, and as knowledge increases so the benefits to mankind will increase, the false will be sifted out and the true only remain.

As to the artificial production of electricity, instead of rubbing a piece of amber, I will rub this glass vacuum tube, and if the electrical force is produced, we shall see it visible in the interior of the tube as a phosphorescence—(making the experiment)—(applause).

What is a vacuum? It is well illustrated by what is known as a water-hammer. This glass tube I have here contains water from which the air has been driven by heat. At the point when all air has been driven from the interior of the tube and the mass of the water, the tube is hermetically sealed. The water absolutely touches the glass, the molecules of the water being in actual contact. There being no gas which may be termed an elastic fluid to prevent the whole weight of the water coming into contact with the glass suddenly, on turning the glass about the water will fall from one end to the other, and as it comes into contact with the glass surface the sound is like a piece of heavy metal falling on a like substance—(making the experiment)—(applause).

If you placed your hand in absolute contact with this table, you would not remove it again without damaging the skin. A similar result is obtained by placing your hand on a hot piece of metal. The heat causes an attentuated atmosphere on the surface of the metal. On placing your finger there you come into actual contact—and you know the result.

Professors Bunsen and Groves were the two scientists more especially connected with what is known as the electric or primary battery. By placing a piece of sheet zinc in acid, and a carbon plate in the same liquor, and attaching a wire to each plate and then pressing the ends of those wires together, a minute spark is seen. The action of the acid on the zinc and the splitting up of the solution at the carbon plate, produces a force which, being conveyed by the conducting wires attached to the plates, ultimately re-produces a chemical action, which may be heat, light, or power. The chemical action is illustrated by what is known as electrolysis, i.e., the splitting up of chemicals in solutions by means of what are known as electrodes. By placing two pieces of carbon in water and connecting them with the zinc and carbon in the acid, the water is split up into its elementary gas, oxygen and hydrogen. That action is the basis of all electrolytical phenomena.

The zinc and carbon couple of the initial primary battery were the bases out of which all primary batteries have been evolutionised. Taking advantage of this, I carried out experiments in the year 1886, which ultimately led to my taking out patents for purifying impure liquids, chiefly by means of the electrolytical action of electrically-connected iron plates. My contention was and is that the great natural purifier of the soil is not only carbon but chiefly oxides and carbonates of iron. Carbon does not undergo chemical change, but the salts of iron in the earth do. Carbon has the property of absorbing a certain quantity of putrefying matter and the resultant gas, sulphuretted hydrogen, but the natural compounds of iron have the property of undergoing a chemical change and producing an oxidising action on organic putrefying matter and entering into chemical composition with the gases produced by the putrefying matter.

Bodies laid in a church yard, the earth of which is impregnated with oxides of iron, (always provided the ground is not overcrowded with bodies) never become a source of contamination or disease. Provided there are sufficient oxides of iron present, a carbon and iron filter will absorb many times more pounds of putrefying organic matter in solution than a carbon filter, before renewal is required. If putrefying matter electrolytically treated with iron plates is mixed with ordinary soil in given quantities, as against given quantities of putrefying matter and ordinary soil only, it will be found that the electrolytical compounds of iron prevent putrefaction in the first mixture, whereas in the latter putrefaction will take place.

Electrolysis is largely used for producing chemicals which once were entirely made by chemical action alone. It is used for taking those dreadful nevi or blood stains from the skin. It is used medically for rheumatic and gouty cases, and I believe in the near future its importance will be still more recognised as a curative. The very action of the 'X' rays, or, what I think I have proved to be the case, the minute brush discharge combined with the 'X' rays—on rheumatic cases certainly has seemed to relieve pain. I mentioned cases of cure in my lectures here in November, 1896–7. The action on the skin is distinctly like electrolysis after long-continued application. Three cases of lupus at the Liverpool Hospital have been completely cured by means of the 'X' rays and possibly brush discharge. Other cases are reported as cured from the Continent, and if, as it seems, the cure is caused by change of the chemical constituents, one may say from putrefactive rot to healthy living cells, then the action again points towards electrolysis. I certainly partly cured a case of sarcoma some two years back, which is vouched for by Dr. Cooper.

We will now try an experiment with iron electrodes, demonstrating the process I have applied to organically contaminated water. This water I have in the small glass tank in front of me consists of a solution of dye added to water. It is an organic dye, and therefore represents organic matter in solution. To this is also added a solution of what represents sewer gas, sulphuretted hydrogen and sulphide of ammonium. You see by placing a light behind this small glass tank that the solution is of a brown-pink colour. I now place in the tank the iron electrodes, which are in series, and connect with these batteries. The particles of organic matter in solution are, as you see, being greatly split up and appear as a flocculent precipitate. The detestable odour of sulphuretted hydrogen has gone, and, as you see, the solution is now as clear as potable water (applause).

Experiments were carried out some years back over a period of something like four years, the money being found by some friends and myself—some ten or twelve thousand pounds. They were conducted in electrolytical troughs of iron, the sewage experimented on running through the electrodes. In one case the electrolytical trough was nearly 200 ft. long. It was most interesting to notice the clearing of the impure fluid from a dirty black to a tinge of green like sea water. The treated fluid having been allowed to clear in an open reservoir, the top affluent is then run off, and as it contains traces of carbonate of iron—which, bye-the-bye, is present in all water from peat countries—it is filtered through six inches of sand. The sandy surface gradually collects a deposit of the oxidised carbonate of iron, and as it to a certain extent becomes granulated it forms a fresh filtering surface. The resulting effluent produces no after bad results in running streams. Other improvements in the process I must not here enlarge on as I may take out patents.

In a tidal river it is not absolutely necessary to filter, and the effluent, if it is considered necessary, can be changed from the ferrous condition into the ferric condition. The product of this electrolysis represented by the flocculent precipitate, which you saw in the small glass tank, consists of ferrous oxide of iron, thrown down with the organic matter, partly in combination and partly in a granulated precipitate. The ferric condition of the effluent can be obtained by passing it through a trough containing carbon electrodes, which act upon the salts in solution and produce hypochlorous compounds, which have the property of further oxidising the effluent.

This effluent, which can be run fresh from the top of the precipitate in the reservoir direct through carbon electrodes, is allowed to precipitate in another reservoir, from which it can be run into the river. What interferes with this or any process is where the liquor to be treated is contaminated with chemical wastes. In that condition it costs more to treat, and therefore is more difficult of purification than the refuse from a town without chemical or other manufactories; for if it is once absolutely turned into a chemical solution naturally it is impossible to entirely eliminate the chemicals, and there is no process that could be invented or thought of to alleviate that. The new nitrification process of the good or common bacteria destroying the bad or zymotic bacteria is very pretty in its action if efficacious. My experience teaches me that the overflows from cesspools or even well-water, which may have been used for many years and generations without harm, will suddenly become pestiferous through organic change. Disease germs seem to me not to be created, but to be the results of the devolution of healthy germs into disease germs, due to the putrefactive environments in which they may be plunged. If organic chemical changes can be produced rapidly so as to render healthy or non-putrefactive the liquid in which bacteria must ultimately exist, then no bad results can be feared.

Bacteria exist everywhere. From my own experience, I am of opinion that the bacteria is not like the Leopard, for it can change its spots and forms, becoming a minute factory of alkaloidal poisons, organic or inorganic compounds. Thus the crenophrix and cladophrix are able to separate from water "iron," possibly carbonate or ferrous oxide, for these compounds of like metal are soluble in water. Thus water from peat beds contains ½ grain ferrous carbonate per gallon. These organisms being vegetables absorb iron in the same way as trees and plants; as they are of a brown colour, like iron may be, present as oxide, but certain organic salts of iron are also of this colour. Some day, I believe, that our organic chemist will evolutionise alkaloids, which will produce the various diseases attributed to bacteria. How the bacteria farmers propose to prevent their bacteria cattle from becoming disease producers is a difficult problem.

There is another difficulty to combat. We will suppose that a town with sewage of 10,000,000 gallons a day has filter beds of nitrate bacteria equal to this amount, as far as capacity is concerned. A storm occurs, and instead of 10,000,000 gallons in twenty-four hours, 10,000,000 gallons in two hours has to be dealt with, what is the remedy? Usually a storm overflow (fitted with flood gates). This quantity, therefore, with blue sweepings of putrescent matter goes into the river unfiltered. We are told that bacteria require seven hours to do their work. My experience, poor as it may be, teaches that twenty-one hours will be required in practice. Finally, as to bacteria. Trust them not, they are deceivers ever.

There seems to be a craving for carbon filters again, but these were tried many years back and found wanting (when on a large scale). To produce a perfect effluent, there is nothing like sterilising the liquid by electrolytical change, when of course all living germs cease to exist. The cost of my process is considerably less now than it was some years back, as the electrical current can be produced at half the cost of what it was then.

Putrefactive change produces a phenomenon called phosphorescence, i.e., by chemical action combined with oscillation, the other is oscillation or rapid vibration without chemical change. A piece of phosphorus glows, as we know, in the dark. This is partly due to the oxidising of the phosphorus, and hence the term 'phosphorescence.'

Mr. Herbert Jackson, of King's College, who I still maintain was the first discoverer of what are known as 'X' rays, delivered a lecture at the last meeting of the British Association with experiments connected with this phenomenon. An extract from his remarkable paper may be of interest:—

> "The phenomena of phosphorescences may be looked upon as outward evidences of response on the part of the substance to rapid oscillations, where these oscillations have their origin in chemical combination, in what is commonly spoken of as light, or in electrical discharge. The nature of that response may be in some cases of a direct character, but when count is taken of the many degrees of persistency of phosphorescence and of potential phosphorescence, it seems in many cases just to assume the form of something which, to avoid circumlocution, may be called a statical charge. The release of that condition of strain is accompanied by

> oscillations which give rise to visible undulations, and hence phosphorescent light. This really means that the bombardment of a substance makes the molecules and atoms of that substance undulate—hence light.
>
> First, if glass, mica, or iceland-spar be placed between different forms of lime and a source of light such as the spark of a coil, with a Leyden jar in circuit, the effect of heating is to intensify the phosphorescence to a blue colour. It is possible to make a specimen of lime give an orange glow in a low vacuum, while a portion of the same specimen is exhibiting a blue glow in a high vacuum with the same source of light.
>
> Under the vigorous bombardment of an electrical discharge of radiant matter, the temperature of the substance bombarded rises, and in some cases this leads to an increase of the brilliancy of the glow, in others the complete absence of phosphorescence. This seems to depend upon the hypothesis that heat endows some molecules with such freedom as to render them uninsulated—hence absence of phosphorescence.
>
> The flame of coal gas burnt in a Bunsen burner will excite phosphorescence in many specimens of lime; a jet of unlighted coal gas allowed to play over warm porous lime produces a slight phosphorescence visible in a dark room. Experiments with many substances used in a similar way to the mantles of the incandescent gas lights indicate that in addition to the ordinary heating effect there is a phosphorescent effect, which probably produces the ordinary hot stage. This phosphorescence can be seen if the mantles are introduced in a tube and treated with an electrical discharge in high vacuum. The attempt has been made to connect the phenomena of phosphorescence with a view to showing them *to be one without a likeness in kind.* It is possible then that the following typical examples of the various phenomena which are described as phosphorescent phenomena are similar in their kind—the glow of phosphorus, the fluorescence of quinine, the sparkling of heated chlorophane, the luminosity of Ballman's paint, the light from lime in a vacuum tube, the glowing of barium platinuo cyanide under the influence of the 'X' rays."

An electric current discharge in a vacuum must have some material molecules or atoms as a conveying medium. Force cannot possibly exist without material. If you could imagine such a thing as a ghost, and could really see it, it must have some material substance, but it is only imagination, and is the action of an over-wrought or over-worked brain.

Electrical force is everywhere. Our world is surrounded by it. We live in an electric sea! And it is visibly illustrated by the Aurora Borealis. The violent wind is very largely due to electric action. On allowing the electric discharge in this tube to bombard the calcined fel spar contained in it, it, as you see, exhibits a bright phosphorescent light. On turning the current off we see that the substance itself is emitting a phosphorence (applause).

A piece of quartz is contained in the next tube, and as you see, it gives a very beautiful glow (loud applause). On turning the current off, it phosphoresces like a red-hot coal (applause).

Here we have various minerals. You see them glow with various tints like phosphorescent flowers. We next come to a piece of coral glowing with an intense phosphorescence due to bombardment. On turning off the current you notice the coral glows (applause). Rubies are in the next tube, glowing with an intense red light as if heated. On turning off the current they still remain in the same condition (applause).

Now the electrical discharge in a vacuum is what is known as 'radiant matter.' When this impinges on this windmill in a vacuum, you will see that the direction of the current causes the mill to turn right or left at a considerable pace.

I have here a Crookes' tube, invented by Sir William Crookes, who has worked more at this portion of science than anyone living at the present day. It well illustrates what 'radiant matter' is. At the end of the tube you will notice a metal cross, and on allowing the electrical discharge in this high vacuum to play upon the end of the tube, you will notice that as the cross is in the field of the discharge, a dark shadow is thrown on the end of the tube. Now, where this dark shadow is, there is no deposit on the glass of 'radiant matter.' Where the 'radiant matter' is being deposited there is a phosphorescence. On allowing this cross to drop out of the field of the discharge, where the dark shadow was, there being no 'radiant matter' deposited, a brighter phosphorescence in the form of a cross will appear as against the less bright phosphorescence where the 'radiant matter' was previously deposited. You see the dark cross (applause). Having dropped the cross by tilting the glass, you will now see the intensely bright cross (loud applause) a positive proof that the discharge of electricity is connected with the violent motion of atoms of material matter. Electricity, therefore, seems to be matter in violent motion.

I have shown that light, electricity, heat, and chemical action are intimately related and co-existing in their action. Life on this world is therefore, in the water period of its existence, intimately related to and mixed up with chemical action, light, heat and electricity.

The Parsees look upon the sun, I believe, as the author and giver of life to this world as we know it. They are certainly right as far as the fact that without the sun no life, as we know it, could exist. The sun, according to the latest discoveries, is undoubtedly a body in a violent state of chemical and electrical action, the outward and visible signs of which are intense light and heat. A storm on the sun, electrical or magnetic, effects similar currents on this world within an infinitesimal space of time.

The planet Venus is known to have an atmosphere. The planet

Mars is known to have ice caps and snow zones at the north and south poles, and long canals are traced across the surface of this planet, which are supposed to be the work of possibly more revolutionised and more intelligent beings than exist upon this earth. It evidently has an atmosphere, and is in the latter water stage condition. As far as can be seen, it is a planet more advanced than ours, as there are no high mountains apparent; denudation and shrinkage have rendered its surface in all probability comparatively flat. Hence the necessity of these canals.

Jupiter seems to be a body less far advanced as regards world-making than the other planets, but here again there are traces of allied phenomena to those which exist as forces on our own earth.

The question which is exercising the minds of many thinkers is—'What is life?' As life is so intimately mixed up with chemical action or regeneration, it therefore seems to be a pulsation. It exists everywhere and may be called—poor term though it is—the Eternal Ether—no beginning, no end!

The Bible contains a good deal of what we call science. It is poetical in its language, and therefore extremely difficult to understand and to sift actual facts from mere tradition, which have no doubt not lost by repetition. If the whole meaning is correct, as I take it, then God is life, life is everywhere and is eternal. We are a portion of that life, and therefore, in the poetical language of Scripture, we are the children of God. Anything happening to us must affect that life. We are even told that not a sparrow falls to the ground without the effect being felt. You begin with life on this world, and, as far as one can possibly see, you end with life. Death is but a transitory condition. I am not putting it from a religious point of view, nor am I by any means a parson. As a man evolutionises his life, so shall that life be fitted to occupy an environment or body in the next life. As scientific knowledge increases and teaches us to use our common senses in an intelligent manner so future generations will lead better lives, more in keeping with the great teaching of nature. Sir William Crookes almost repeats the old prophecy that swords shall be turned into plough-shares, for he has told you that, in the great future, as nitrogenous compounds in the ground are being exhausted in all our great wheat-growing countries, and that as nitrates must be obtained, and the nitrate bodies are being exhausted, so men's attention will be more and more devoted to the tilling and manuring of the ground for producing the great staff of life. In the great struggle for existence men will be drawn together by one common feeling—the preservation of life on this earth. And science will be the cause of war ceasing, reciprocal trading between nations ultimately developing into one universal family upon the earth.

Now, ladies and gentlemen, I thank you very much for your kind attention. I am afraid I have bored you upon one or two matters that I have been discussing to-night. I developed the idea of the subject-matter of this lecture, the title of which was suggested by Major Abdy, and I have done my best to show you in a short space of time certain scientific opinions connected with it.

With regard to the ether, which is not yet developed in a visible form, it is undoubtedly intimately connected with life. I again thank you for your very kind attention (loud applause).

The Chairman: Ladies and gentlemen, I am sure from your applause that my anticipations as regards the lecture have been quite fulfilled; Mr. Webster has taken us a very pleasant journey along this borderland. The worst I may put it of listening to such a finished lecture as his is that we are apt to go away and think that we know all about the subject. That I am afraid cannot be done in such a short time; but I am sure you will agree with me that Mr. Webster has in a short time given us a large amount of subject for thinking about, and I hope also he has excited our curiosity so that many of us will extend our knowledge of the sciences that he has brought before us.

Mr. Webster has mentioned one or two things in his lecture which I should like to say a word about.

There was that question of mind telegraphy. I know that scientific people are very apt to say that everything they cannot understand (I am afraid Mr. Webster says that what he cannot see he does not believe in) is not all true; still there is a very scientific man, Professor Crookes, who is certainly a believer in these things, and has been for a long time, for I met him many years ago on a sea voyage; but I was told the other day of an actual case in which a man and his wife arranged all their plans while they were hundreds of miles apart from one another. You cannot say that they have not done so if you find that they have, so there must be something in it at all events.

The other question which I think is a very interesting one is that in which Mr. Webster told us about the marvellous photography of the stars; that every day astronomers are photographing stars which the human eye will never see. We can hardly realise it; but it was brought to my mind very clearly by a photograph that I saw of a cellar. The cellar was absolutely dark to the human eye; you might be there an hour and not see one part of it. They exposed the camera with a plate in it for three weeks—it was a very long exposure—but at the end of that time a perfect photograph of that cellar was produced, every little brick in it was re-produced. It is exactly the same thing in these star photographs every night; the human eye never can and never will see them them, but there they are and there we can photograph them.

And there is one question that I should like to ask: whether in this purification which Mr. Webster has been so anxious to do for our towns, any progress has been made in purifying the atmosphere by electricity. There is a very pretty experiment that I have seen in which a long tube was filled with smoke, but was made instantly quite clear by taking a spark across it, and I should like to know whether it would be possible to clear the atmosphere from these horrible fogs that we have been experiencing of late. Perhaps some other gentleman would like to ask Mr. Webster some questions. If no gentleman has any question to ask, I can only say that I am sure your feeling and mine must be the same, that is to thank Mr. Webster most heartily for the lecture he has given us, and I hope it will not be the last that we shall hear from him (loud applause).

Mr. Webster: Ladies and gentlemen. In reference to the question asked by your Chairman this evening, I may say that nothing has been done of a practical nature. As a matter of fact, it is found that any electrical apparatus would be so enormously expensive and so large that it would be impossible to do it with any chance of success. On this coil you will see a practical demonstration of the collection of dust or, for the matter of that, smoke. It is covered entirely with dust from the room. The dust itself being negative and the coil positive, the particles are attracted to it, and hence the film I now wipe away with my hand. I was exhibiting the Röntgen Rays at the Royal Institute some little time ago in a room with a moving audience. The Jackson Tube I was using was covered, I found, on turning up the light after the demonstration, with a thick coat of dust, so thick that I could scarcely see the metal anode and cathode in the tube. It was the dust from the dresses and floor raised by the moving audience. Smoke is attracted in a similar way, and you will find in a room which is thick with tobacco smoke, traces of nicotine on the glass tube in action.

Professor Tesla may possibly affect fogs by his wonderful apparatus for telegraphing long distances through the atmosphere, if it is true he is going to revolutionise telegraphy and everything we know in connection with it. The only thing to be feared is that it might produce abnormal quantities of rain, a thing we certainly do not require in this country.

I do not believe many things that I cannot see, but personally, at intervals, being gifted with the power of intuition or thought reading, I certainly believe in mental telegraphy.

THE ARTILLERY IN THE INDIAN CAMPAIGNS OF 1897-8.

(Map attached.)

BY

CAPTAIN G. F. MACMUNN, *D.S.O.*, R.A.

THE number of batteries that took part in the various campaigns on the North West Frontier of India during 1897–8 is so large, (twenty-one in all) that it seems a pity that no collective account of their doings has been made in a form easily get-at-able for officers of the Regiment. I had hoped that some one better qualified than myself would have undertaken to do so, but as no one seems to have come forward I venture to make a *résumé* of each battery's share in the campaigns in the hope that such a record may be of general interest. Some of the batteries suffered very severely indeed and gained great distinction well worthy of record more attainable than in official reports and despatches.

An outline of the operations on the North West Frontier and the sequence of events is first necessary to follow the doings of the Artillery. The Pathan Revolt as it has been called, commenced with the outbreak in Waziristan in June, 1897, where a small force was unexpectedly and treacherously attacked during political negotiations, in which a section of No. 6 Bombay Mountain Battery took so conspicuous a part. This was followed at a short month's interval, by the equally unexpected rising in Swat in a quite distinct part of the Frontier, and the desperate attacks on the Malakand and Shabkadr. No. 8 Bengal Mountain Battery took a leading part in the defence of the Malakand. From the North East corner of the Frontier the fiery-cross now spread towards the Peshawur border, and the extraordinary sight in modern times, of a hostile force invading the plains of India was beheld, the Mohmands decending from the hills and, after burning British villages, were encountered at Shabkadr in the open by a small force hastily pushed out from Peshawur.

The contagion now spread to the Khyber and the various forts there, were attacked by the Afridis, the rising finally crossing over to the Orakzai country and far away up to Kurram and the hills below the Safed Koh. The Orakzais aided by Afridis desperately attacked the British posts on the Samana Range and overflowed into the peaceful Miranzai valley, finally capturing the post of Saragarhi and making a desperate attempt to carry the larger fort of Gulistan.

Three batteries actually took part in the first attempts to withstand the rising. A section of No. 6 Bombay Mountain Battery forming part of the force at Maizar, losing Captain Brown and Lieut. Cruickshank killed, five rank and file killed and wounded, and eight mules killed and finally fought its way out with the greatest coolness and resource.

No. 8 Bengal Mountain Battery formed part of the Malakand garrison and was constantly in action day and night for several days, losing Lieut. Wynter, (then commanding) wounded and several rank and file killed and wounded (for detail *vide* Battery's services).

Four guns of the 51st Field Battery, R.A. formed part of the force that pushed hurriedly out of Peshawur, to repulse the Mohmand inroad at Shabkadr, under command of Captain Blacker, the only officer present with the battery. He and two sergeants were severely wounded, Sergt.-Major Wallman taking command and bringing the battery out of action. The ground being very much intersected with nullahs, the battery had great difficulty in getting its guns into action, and the enemy's marksmen were able to creep close in to the guns amongst the broken ground.

After the Maizar outbreak in Waziristan, then deemed a solitary instance of fanaticism and treachery, two brigades commanded by Major-General Corrie Bird, C.B., entered Waziristan, the batteries with this force being No. 3 Peshawur Mountain Battery and No. 6 Bombay Mountain Battery. This expedition met with little subsequent fighting but spent ten weary months in very barren hills, harassed by an evasive enemy and subject to unaccountable prevalence of dysentery and typhoid, the force being of necessity maintained in the country to prevent the Waziris joining the Afridi rebellion.

As soon as news of the Malakand outbreak reached headquarters relief was instantly despatched, but it had hardly started ere outbreak after outbreak, everywhere least expected, occurred, and all order and organization was lost for the moment, in the absolute necessity of putting the nearest available troops into the weakest spots. Regiment after regiment, battery after battery hurried up by rail, to dis-entrain and spend a day at one place only to be hurried off, no one knew where, to meet some fresh inroad. There was not even time to mobilize batteries ere they left, and cart-loads of mobilization stores were often picked up pell-mell at a railway station *en route* to be assimilated as best they might on arrival. Batteries would start (it was the height of the leave season) with perhaps one officer, while strange officers joined at stations en route, to do duty till those on leave could rejoin. Nothing could be more exciting than the constant whirl of troops stores, and transport up a single line of rail for three points, Kushalgarh, Peshawur, and Nowshera whence the roads left for the front. 60,000 men were in front, many were yet unmobilized, all had to be fed, and transport passed up to equip four large forces taking the field in different directions.

As troops fitted into their places, all danger of inroad ceased, and preparations for aggression on our part were pushed on.

In August and September the following forces were in the field:—

		ARTILLERY.	
I.	Malakand Field Force, three brigades, Comdg. Sir Bindon Blood, K.C.B., R.E.	No. 10 Fd. R.A. No. 1 Mn. R.A. No. 7 Mn. R.A. No. 8 Bengal M.B.	Colonel W. Aitken, C.B., A.D.C., R.A.
II.	Mohmand Field Force, two brigades, Comdg. Major-General Elles, C.B., R.A.	No. 3 Mn. R.A. No. 5 Bombay M.B.	Colonel A. E. Duthy, R.A.
III.	Kohat Kurram Field Force, not organised by brigades; (strength about two brigades, largely cavalry), Comdg. Major-General Yeatman-Biggs, C.B., R.A.	No. 3 Fd. R.A. No. 9 Fd. R.A. No. 2 Derajat M.B.	—
IV.	Waziristan Field Force, two brigades, Comdg. Major-General Corrie Bird, C.B.	No. 3 Peshawur M.B. No. 6 Bombay M.B.	—

V.

In addition to these troops, a considerable force of observation was stationed about the mouth of the Khyber and the Bara, at Forts Bara and Jamrud.

Force round the Khyber and the Bara.	'F' R.H.A. 'K' R.H.A. No. 57 Fd. R.A.	—

(The doings of each battery will be recorded separately).

In October, arrangements were complete for advancing on Tirah, the forces numbered I. and IV., in Swat and the Tochi remained unchanged, the Mohmand Field Force and the Kohat–Kurram Force became merged in the Tirah expedition, the latter force (Kohat–Kurram) having previously spent many arduous weeks in constant countermarching and fighting to protect a very large area of country.

ORGANIZATION OF THE TIRAH EXPEDITIONARY FORCE.

		ARTILLERY.	
(A.)	Main Force. 1st Division. Maj.-Genl. Penn Symonds.	No. 1 Mn. R.A. No. 1 (Kohat) M.B. No. 2 (Derajat) M.B.	Colonel A. E. Duthy, R.A.
	2nd Division. Maj.Genl. Yeatman-Biggs.	No. 8 Mn. R.A. No. 9 Mn. R.A. No. 5 (Bombay) M.B.	Colonel R. Purdy, R.A.
(B.)	Kurram moveable Column. Commanding Col. Hill.	ARTILLERY. No. 3 Field, R.A.	—
(C.)	Line of communication Force (Kohat line). Commanding Lieut.-General Sir Power Palmer.	ARTILLERY. No. 9 Field, R.A. No. 1 (Kashmir Imperial Service) M.B.	—
(D.)	The Bara Column, or 5th Brigade Tirah Expedit'ary Force. Commanding Brigadier-General Hammond, V.C., C.B., D.S.O.	ARTILLERY. No. 9 Fd. R.A. No. 3 Mn. R.A.	Lieut.-Colonel W. W. Marriot Smith, R.A.

Brigadier-General Spragge, C.B., R.A., commanded the Artillery of the expedition. The total of Artillery employed with this expedition was three field batteries, eight mountain batteries and one rocket battery, twelve in all.

Yet another unexpected outbreak occurred in a distant part of the Frontier in Mekran between Karachi and Persia. A section of No. 4 (Hazara) Mountain Battery accompanied a punitive force to Mekran.

Early in January the Malakand Force with all its artillery marched into the Buner country. A short and successful expedition followed.

Dealing with each campaign in order and detailing each battery's share under each campaign we have—

1. OPERATIONS IN WAZIRISTAN (THE TOCHI VALLEY).

Hostilities commenced as has been said with the treacherous attack on 10th June 1897 on a small escort accompanying the Political Officer, commanded by Colonel Bunny of the 1st Sikhs, consisting of 300 rifles, two guns No. 6 Bombay Mountain Battery, and twelve sowars.

The force halted close under a village and was attacked (while resting and eating) from the village. Much comment was made on Colonel Bunny's accepting such a spot to halt in, but as he was an officer of great experience and known of his caution, the unexpected nature of the attack will be well understood. All six British officers with the force were killed or wounded and forty-seven men. A strong force was despatched to quell the disturbance and punish the offenders. Further hostilities were of a trivial nature.

No. 3 Peshawur Mountain Battery (Captain Giles) formed part of the Tochi force from July, 1897, to January, 1898, minor operations—fired seven shell, two star. Casualties: wounded one mule.

No. 6 Bombay Mountain Battery (Captain J. F. Brown and after, Captain Williamson). One section under Captain Brown and Lieut. Cruickshank, formed part of the Maizar escort, treacherously attacked at close quarters, fired case and reversed shrapnel, and killed thirty-five of the enemy. Both officers killed, native N.C.O. Havildar-Major Muhammad Ismal took command of the section which covered the retreat very steadily carrying its dead and wounded and constantly firing for four miles. Here Lieut. de Brett, R.A. of the Battery arrived from Datta Khel with men, mules and ammunition. Fired sixty shell, eight case, two star. Casualties: killed, two British officers, three men, four mules; wounded, two men, six mules. (Several men received the Order of Merit for their behaviour).*

2. MALAKAND, OPERATIONS IN SWAT.

Here the artillery being partly pack and partly wheeled, the batteries were usually in action separately, it is worth noting that in the Buner expedition at the storming of the Tangai Pass, the three batteries engaged were firing over the heads of our infantry for four hours, only ceasing when the latter had reached to within 100 yards of the crest in which were the enemy's sangars.

No. 10 Field, R.A. (Major Anderson) moved from Rawal Pindi within twelve hours of the orders to mobilize; heat (in August) intense, rapid and trying march from Nowshera to the Swat Valley. Action of Landikai (17th August), ranges 1,450 to 1,600 yards. Fired 132 shrapnel—made wonderful marching in difficult country with use of ingenious makeshifts for passing along narrow tracks. Complimented in orders. Malakand force became Buner force in January, 1898, battery present at capture of Tangai Pass, in action 4¾ hours, ranges from 2,000 to 2,500 yards, fired 476 shrapnel, no casualties, several losses early in campaign among men and horses from intense heat. For No. 1 Mn. R.A., see Tirah.

No. 7 Mn. R.A. (Major Fegen) marched from Baragalli in Murree Hills, thirty hours after orders to mobilize, entrained at Hasan Abdul on 31st July, having marched fifty-three miles in forty-six hours in awful weather, to assist in relief of the Malakand. Actions at Landakai 17th August; marched to the Mohmand Valley, action at Agrah and Balai in September and October, 1897, and January, 1898, Buner expedition, capture of Tangai Pass. Casualties: one mule wounded, fired 164 shell.

No. 8 Bengal Mountain Battery (Captain Birch) formed part of the original peace garrison of the Malakand, took part in the desperate and prolonged defence, firing star shell several nights and mornings, Lieut. Wynter being in command at the time (severely wounded), took part in the relief at Chakdara, action of Landakai operations against Mahmunds, night attack on our camp at Inayat Killa, 16th September, troops belated during retirement, four guns of battery, Brigadier-General Jeffries, thirty sappers, ten men of East Kent, ordered to bivouac in village–desperate defence against tribesmen at night; Lieut. Crawford, R.A., killed, Lieut. Wynter, R.A., again wounded, heavy casualties, almost all the gun teams shot. During rest of the operation the battery was so reduced from casualties that barely four guns could turn out. Served with 1st Brigade Buner Field Force, capture of Tangai Pass. Total casualties: one British Officer killed (Lieut. Crawford) nine men and twenty-one mules. Wounded: two British Officers, Lieut. Wynter twice, Captain Birch slightly, one native Officer, thirty-two men, eight mules; total forty-five men, twenty-nine mules, an almost unprecedented loss in a single battery; (several men received the Order of Merit for their gallant behaviour.)

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* For detailed account of the part played by No. 6 (Bombay) Mountain Battery, see 'The Maizar Affair' by Captain L. C. Gordon, R.A., R.A.I. "Proceedings", Vol. XXIV., No. 12, 1897.

3. The mohmund expedition.

This expedition consisted of a division commanded by Brigadier-General Elles, c.b., R.A., moving into the Mohmund country towards the end of September, co-operating with part of Sir Bindon Blood's force from Swat. General Elles' division met with comparatively little fighting though two of Sir Bindon Blood's brigades had some very sharp work *en route* to co-operate with him.

The Mohmunds were severely punished made complete submission; the batteries taking part have been detailed already and afterwards took part in the Tirah expedition.

4. Kohat kurram force.

Operations under Colonel George Richardson, c.b., cie., subsequently under Major-General Yeatman Biggs, c.b., R.A., in Kurram and on the Samana. Notable, so far as the Artillery is concerned, for two wonderful marches by No. 2 Derajat Mountain Battery; details of which are given under the heading of 'Tirah' to which these operations were a preliminary. The fighting on the Samana consisted of desperate attempts of Orakzais and Afridis to capture our line of fortified posts on the crest of the Samana Range, and generally overflow into peaceful territory, while many of the tribes within our border were not slow to join them in the belief that the British Raj was at its downfall.

5. The tirah expedition.

The preliminaries of this were, *first* the Afridi attacks and capture of the Khyber forts held by the Khyber Rifles, a local Militia, of which Landi Kotal, Ali Musjid, and Fort Maude were the principal. Fort Maude near the mouth of the Khyber was evacuated by its garrison under the fire of 'K' Battery R.H.A., which had advanced to the entrance to the pass; *second* the Orakzai's and Afridi's combined attacks on the Samana Range followed by risings of various tribes between Kohat and Kurram, all of which it was the aim of the Kohat–Kurram Force to resist pending our being ready for an actual advance. The troops for this campaign were all assembled in the various columns already detailed by the middle of October. The main body was to strike from the Kohat–Kurram road, assembling at Shinawari, and cross the pass tranversely, in the direction of the Khanki, Mastura and Barah watersheds, so as to arrive directly on to the head waters of the valley forming the Orakzai and Afridi Tirah, a far preferable plan to working up the valleys from their openings on our own frontiers, and conferring considerable strategic advantages. The Bara column acted as a containing force at the opening of that valley, the Kurram moveable column doing the same in that direction. It is not necessary or possible in the space to relate or discuss the campaigns further than to illustrate the doings of the various batteries, or to refer or combat such criticisms as the campaigns have evoked, suffice it to say the advance to Bagh *viâ* Shinawari entailed the forcing of three very high passes, the Chagru Kotal, the Sampagha and the Arhanga. Before the actual advance began, engagements occured in reconnoitring and while improving the approaches to the pass. At the storming of Dargai,* which took place on 20th October, 1897, and at the forcing of the Chagru Kotal, four Mountain Batteries were in action No. 8 and 9, R.A., and No. 1 Kohat and No. 5 Bombay, Mountain Batteries, Colonel Purdy commanding. Three of these batteries were massed, one detached. The enemy's losses here were almost entirely due to artillery fire, they being so posted that rifle fire could not touch them, and the attacking infantry being shot down without being able to make effective reply.

The next engagement of artillery of any importance was on the 29th October, at the forcing of the Sampagha, where the batteries worked to a great extent by brigade divisions, the G.O.C., R.A., Brigadier-General Spragge controlling the 6 batteries, Nos. 1, 8 and 9, R.A., 1, 2 and 5, Native. This was almost entirely an artillery battle, and the effect of combined fire completely drove off the enemy; heavy infantry fighting had however been looked for and a big casualty list. The fight ended by No. 5 Bombay M.B. being pushed forward, when Captain deButts, R.A., was killed on rounding a bluff at the head of his battery, which suddenly came under a fire from a ridge in front.

Lieutenant Edlmann at once assumed command, and taking a section, closed in to 500 yards and cleared the ridge of the enemy, a most dashing feat for which he was commended in despatches. It is no small thing to stand to your guns at 500 yards range from marksmen armed with Martinis and Lee Metfords, but so does audacity bring its own reward in war, that wonderful to relate there were no more casualties in the section.

Three days later the force crossed the Mastura Valley, and forced the Arhanga Pass, the batteries again working by brigade divisions; few casualties occured among the British, and the heart of Tirah, the plateau of Maidan and Bagh was reached. After this, batteries were constantly engaged, generally singly; early in December the troops withdrew from Tirah and the scene shifted to the Khyber with several engagements but no massing of Artillery. The troops remained camped within the enemy's territory till April, prepared to advance if our terms of fines in money and rifles were not paid up.

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* For account of Dargai, see 'Artillery at Dargai,' by Lieutenant G. F. MacMunn, *D.S.O.*, R.A., R.A.I. "Proceedings", Vol. XXV., No. 4, 1898.

Summing up the results of the campaigns it may be said that every rebellion or invading section was severely punished, though our humanity and clemency was often mistaken for weakness.

The Afridi himself could never stand against us, save in unapproachable positions, and his warfare was only of the hopeless guerilla species, most trying to the troops in contact with him, but availing nothing in stopping our advance one single day. Following the law of nations at war, when our enemies beaten from the field, insisted on maintaining an unprofitable warfare, we burned their property till they came to their senses, even as the Prussians threatened to shell the town of Sedan if useless hostilities were kept up; it is only now that the Afridis are really feeling the pinch, resulting on their punishment of last year.

The Artillery tactics were simple in plan but difficult to carry out; nearly all the minor engagements took place when withdrawing from positions captured or visited in operating against the enemy. A force must withdraw at times, and the signal to withdraw was always followed by an appearance of hordes of creeping Afridis on all sides. The duty of the Artillery was to cover the rear-guard in its succesive positions, yet not to imperil its guns and still more impede the withdrawal. It required therefore great judgement to know when to withdraw a battery and when to come into action again. The manipulation of the 2nd line of mules corresponding to battery waggons, never so simple as it seems, was in such a country no easy matter.

It should be mentioned that an ammunition column officer was appointed to each brigade division of the Tirah force, to take charge of the reserve ammunition mules of each battery and take back convoys for more artillery ammunition.

The services of each battery serving in this force with any share in the preliminary fighting must now be detailed.

3rd Field Battery, (Major Guise) served in the Kohat–Kurram line from 27th August, 1897 to 22nd April, 1898, first with the Kohat–Kurram field force, later with the Kurram moveable column as part of the Tirah expeditionary force, fired forty rounds, one gun accompanied the reconnaisance of the Khurmana defile, but four miles up the defile could proceed no further, casualties : nil.

9th Field Battery (Major Wedderburn) arrived at Kohat 22nd August, 1897, from Mian Mir, entraining within thirty-nine hours of orders to mobilize, and joined the Kohat–Kurram Field Force; shared in the action of the Ublan Pass, when the enemy approached within three miles of Kohat itself, making excellent practice; minor actions on the Samana and mouth of Khanki Valley; two guns were moved from Doaba on 13th September, to make an attack on those besieging Gulistan fort which Major DesVoeux was defending. The guns were some 2,000 feet below, but their arrival cheered the hard pressed garrison, and also diverted the enemy's attention from the advance of the actual relieving force; fired 165 rounds; casualties nil.

57th Field Battery (Major Helyar) moved to Peshawur from Campbellpore in August, 1897, hurried out to Fort Bara, formed part of Bara Column of Tirah Expedition, accompanying that force up the Bara as far as Ilam Gudr. Accompanied this Bara Column (now 5th Brigade, Tirah Expeditionary Force) up the Khyber to Landi Kotal; various reconnaissances and minor engagements; fired 123 rounds; casualties; one driver wounded.

No 1 Mountain Battery, R.A. (Major Norton) formed part of the Malakand Force; took part in Mohmand Expedition; joined 1st Division Tirah Force in October, marching *viâ* Kohat Pass; actions at Kharrappa; forcing of Sampagha and Arhanga Passes; various minor actions; fired 205 shell, twenty-two case, and twenty-eight star; casualties: killed, three mules; wounded, four soldiers, two followers and six animals.

No. 3 Mountain Battery, R.A., (Lieut.-Colonel Dacres Cunningham) served with General Elles' division of the Mohmand Field Force; actions of Bedmanai Pass and at Jarobi; Tirah Expedition with the Bara Column; action at Barkai; subsequent constant actions during re-occupation of Khyber; remained in Garrison of Landi Kotal after suspension of hostilities; fired 123 shell; casualties: wounded, one driver.

No 8 Mountain Battery, R.A., (Major Shirres, *D.S.O.*). Tirah Expeditionary Force, 2nd Division. Reconnaissance of Chagru Kotal, 18th October; battle of Dargai; capture of Sampagha and Arangha Passes; numerous minor actions; fired 1,407 shell and twenty-five star; casualties: killed, one driver and six mules; wounded, nine men and five mules and ponies.

No. 9 Mountain Battery, R.A. (Major Powell) formed part of Kohat Kurram Force for a short time; then joined 2nd Division of the Tirah Expeditionary Force; reconnaissance of the Chagru Kotal on 18th October; battle of Dargai; captures of Sampagha and Arhanga Passes; various minor actions; fired 775 shell and 96 case, casualties: killed, one driver, wounded, one driver, one muleteer and three mules.

No. 1 (Kohat) Mountain Battery (Captain St. John), 1st Division Tirah Expeditionary Force, attached to 2nd Division for action of Dargai and returned to Shinawari; actions outside Kharrappa in Khanki Valley, one gun burst, another had sights shot away; capture of Sampagha Pass; operations in November against Mussazai, and attached to Kurram Force in operations against Chamkannis, where it inflicted heavy loss on the enemy; operations in Waran in December; surprise of Karrana; actions at Aspoghar and Burj during re-occupation of the Khyber; fired 872 rounds; casualties: killed, three mules; wounded, two men and one mule.

No 2 (Derajat) Mountain Battery (Captain Parker). Two sections served with Kohat–Kurram Force from 20th August to 15th October; marched from Hangu to Sada in intense heat by forced marches with Colonel Richardson's flying column, and again returned by forced marches to relieve the Samana Forts, its last stage being *thirty-six miles in twelve hours* from Thall to Hangu; relief of Samana Forts on 14th September; the remaining section present at night attack on Sada. The battery served with 1st Division Tirah Expeditionary Force; forcing of the Sampagha Pass; severe fighting at Bagh on 18th October, guns engaged at 500 yards from enemy; constant and harassing rear-guard actions crossing the Kahu Darra Pass on 27th, 28th and 29th November. On 29th November, after being in action twelve hours, the battery crossed the pass by night. On one occasion the guns of a section were firing in opposite directions so pressed was the rear-guard. Fired 631 rounds; casualties: killed, one man and four mules; wounded: one British officer and four men.

No 5 (Bombay) Mountain Battery, (Captain deButts and after Captain Money), served with Mohmand Field Force, September and October; joined Tirah Expedition *via* the Kohat Pass; reconnaissance of Dargai and Chagru Kotal on October 18th; rear-guard relieved of very heavy pressure by accuracy of its fire; battle of Dargai, October 20th; capture of the Sampagha (Captain deButts, killed) and Arhanga Passes; expedition to Waran; two actions at Saransar; reconnaissance to Dwatoi and Rajgul Valleys; constant minor actions; march down the Bara; severe actions on 13th and 14th December, inflicted heavy loss on enemy; one section took part in the severe engagement at Shinkamar Pass on 29th January; fired 1,952 shell and two star; casualties: killed, one British officer, one man and four mules; wounded: four men and three mules.

No 1 (Kashmir) Mountain Battery, (Lieutenant MacMunn, *D.S.O.*) one of the two Kashmir Imperial Service Mountain Batteries; marched from Kashmir and joined Tirah Expeditionary Force on 12th October; served on lines of communication and with force in the Khanki Valley; various foraging expeditions, and at Kharrapa; accompanied expedition to Mamuzai Bazaar.

The Rocket Battery (Major Browne) formed at the request of Sir William Lockhart for the Tirah Expedition. The gunners were drawn from No. 5 Company, Western Division, R.A., and the drivers and mules from No. 5 Mountain Battery, R.A., organization and equipment similar to a Mountain Battery; action of Dargai; action round Kharrappa; some difficulty found in firing at long ranges; very alarming noise on discharge.

PESHAWUR FORCE.

This consisted of various corps stationed on the frontiers close round Peshawur for the purpose of blocking the enemy from attacking British territory in the plains.

'F' Battery, R.H.A, (Major Cunliffe) hurried up to Peshawur from Sialkot in August, 1897. Remained during operations at various places near mouth of the Khyber. Casualties: nil.

'K' Battery, R.H.A., (Major Potts) hurried up to Peshawur from Rawal Pindi after the Mohmand raid; relief of Fort Maude in the Khyber; fired sixty rounds; casualties: nil.

51st Field Battery R.A., (Captain Blacker). Four guns of this battery were pushed out to Shabkadr, on 5th September, from Peshawar, under Captain Blacker. Leave season. No other officers with battery, as one subaltern had to stay with two guns in Peshawur. Action at Shabkadr, on 9th, Captain Blacker severely wounded; Sergeant-Major Walman takes command; guns at one time seriously threatened. Fired sixty-two shell; casualties: wounded, one officer, two non-commissioned officers and one horse. (Sergeant-Major Walman received the Distinguished Conduct Medal).

Mekran expedition.

This took place early in 1898 in consequence of an attack on a survey party on the Mekran coast, between Karachi and Persia. Force, under Colonel Maine, consisting of a wing of the Baluchis, a detachment of cavalry and two guns of No. 4 (Hazara) Mountain Battery. Enemy defeated.

No. 4 (Hazara) Mountain Battery, two guns (Lieutenant Paine). Actions on 31st January and 2nd February; guns well handled; fired 125 shell and six case; casualties: killed, one man; wounded, one man.

With this expedition, ends the varied series of operations on the N.W. Frontier of India in 1897–8, in which twenty-one batteries in all took part. In addition to the officers employed regimentally, several R.A. officers were serving on the staff, both army and personal, while three R.A. General officers were in the field. Major - General Yeatman-Biggs, C.B., commanding the Kohat–Kurram Force, and afterwards the 2nd Division of the Tirah Force; Brigadier-General Elles, C.B., who commanded a division in the Mohmand Expedition and troops round the Peshawur Frontier and at the action at Shabkadr, and thirdly, Brigadier-General Wodehouse, C.B., C.M.G., who commanded a brigade in the Malakand Field Force and was severely wounded at Nawagai. Several officers R.A. also did excellent service as transport officers, the hardest and most thankless job of all and perhaps the most important since an army "crawls on its belly." There were also, of course, several officers of the Regiment in the field in charge of the Ordnance Parks.

Little now remains to be said, though it has only been possible to outline each battery's doings, and that but disjointedly. The various General Officers commanding expeditions were most complimentary in their acknowledgements of the work of the Artillery in their commands, and many R.A. officers were mentioned in despatches. At a lecture given in the United Service Institution, Simla,* on the Tirah Campaign, General Tyler, the Inspector General, Royal Artillery in India, commented on the tendency of General officers to split up the batteries in their command, which always resulted in so great a loss, power and fire effect, as well as unnecessary movements when in action. These are troubles the artillery have always to contend with. All are familiar with the sort of order "to come into action, fire a round or two, and go on in pursuit!" In hilly country like the North West Frontier, working by Brigade Divisions was, of course, seldom possible, and only took place at a few of the larger engagements.

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* 'The Story of Tirah and the lessons of the campaign,' by Colonel H. D. Hutchinson, D.M.E. "Journal of the United Service Institution of India", Vol. XXVII., No. 132, July 1898.

Mention should be made of the impromptu Mountain Artillery Depot organized at Rawal Pindi to supply all the Mountain Batteries in the field. This was raised from drafts of men and animals from various corps, and from the reservists of the Native Artillery. A strength of five British officers, fifty British gunners, sixty Native gunners, 140 Native drivers, and 150 horses and mules was maintained during the operations. Five officers, 366 men and sixty-seven animals were supplied during the operations, by the Depot. The Horse and Field Batteries were supplied by their supplying batteries, but as only one Mountain Battery remained in India that was not on the frontier, it was very shortly exhausted and hence the need for this Depot.

12-pr. B.L. Elephant Battery.—In case 12-pr. guns should have been required in Tirah beyond the reach of wheeled artillery, 'A' Battery, R.H.A., was organized at Peshawur as a pack battery on elephants, supplied by the Heavy Battery at Campbellpore. Its services, however, were not required.

Attached is a Table shewing the Batteries engaged and their casualties.

The writer would apologise to batteries and officers engaged in the operations for any errors he may inadvertently have made.

TABLE SHEWING SERVICES AND CASUALTIES BY BATTERIES.

	Battery.	Name of Commanding Officer.	Expeditions and operations taken part in.	Casualties. Killed.			Casualties. Wounded.		
				Officers.	N.C.O's and men.	Animals.	Officers.	N.C.O's and men.	Animals.
1	'F', R.H.A.	Major F. L. Cunliffe	Peshawur Force ...	—	—	—	—	—	—
2	'K', R.H.A.	Major J. W. H. Potts	Peshawur Force, relief of Fort Maude	—	—	—	—	—	—
3	3rd Field R.A.,	Major H. Guise ...	Kohat-Kurram Force Tirah Expedit'ary Force	—	—	—	—	—	—
4	9th ″ ″	Major A. S Wedderburn	Kohat-Kurram Force ...	—	—	—	—	—	—
5	10th ″ ″	Major C. A. Anderson	Malakand Expedition Buner Expedition	—	—	—	—	—	—
6	51st ″ ″	Captain S. W. W. Blacker	Peshawur Force—Shabkadr	—	—	—	1	2	1
7	57th ″ ″	Major A. B. Helyar ...	Tirah Expedition—Peshawur Column	—	—	—	—	—	—
8	1 Mountain ″	Major G. F. A. Norton	Malakand Force, Mohmand and Tirah Force	—	—	3	—	6	6
9	3 ″ ″	Lt.-Col. J. D. Cunningham	Tirah Expedit'ary Force Peshawur Column.	—	—	—	—	1	—
10	7 ″ ″	Major M. F. Fegen ...	Malakand Force—Buner Expedition.	—	—	—	—	—	1
11	8 ″ ″	Major J. C. Shirres, *D.S.O.*	Tirah Expedit'ary Force	—	1	6	—	9	5
12	9 ″ ″	Major A. ff. Powell ...	Kohat-Kurram Force Tirah Expedit'ary Force	—	1	4	1	4	5
13	1 (Kohat) M.B.	Captain G. F. W. St. John	Tirah Expedit'ary Force	—	—	3	—	2	1
14	2 (Derajat) ″	Captain J. L. Parker ...	Kohat-Kurram Force Tirah Expedit'ary Force	—	1	4	1	4	5
15	3 (Peshawur) ″	Captain F. H. S. Giles	Waziristan-Tochi Force	—	—	—	—	—	1
16	4 (Hazara)† ″	Lieut. J. H. Paine ...	Mekran Field Force.	—	1	—	—	1	—
17	5 (Bombay) ″	Capt. F. R. McC. de Butts Capt. A. W. Money	Mohmand Expedition Tirah Expedit'ary Force	1	1	4	—	4	3
18	6 ″ ″	Capt. J. F. Brown. Capt. O. C. Williamson.	Waziristan, Maizar and Tochi Force.	2	3	4	—	2	4
19	8 (Bengal) ″	Captain F. H. J. Birch	Malakand and Buner Expedition.	1	9	21	3*	32	8
20	1 (Kashmir) ″	Lt. G. F. MacMunn, *D.S.O.*	Tirah Expedit'ary Force	—	—	—	—	—	—
21	Rocket Battery	Major Browne	Tirah Expedit'ary Force	—	—	—	—	—	—

* Includes one Native officer wounded. Lieutenant Wynter was twice wounded.

† Two guns only.

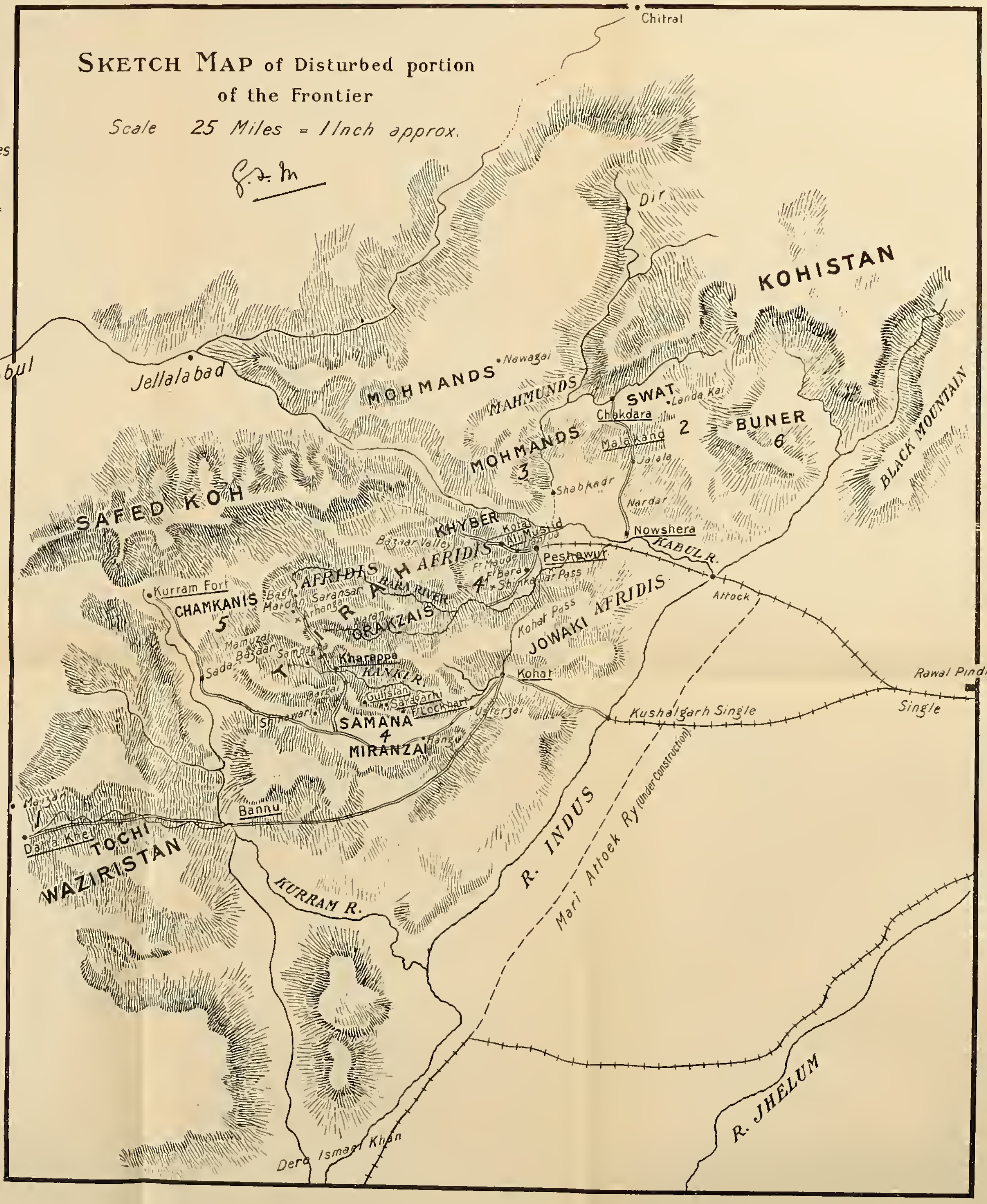
Summary of casualties:
- Four officers killed and five wounded (including one Native officer.)
- Seventeen men killed and sixty-three wounded of all ranks.
- Forty-five mules and horses killed, thirty-eight wounded.

Brigadier-General Wodehouse, C.B., C.M.G., R.A., was wounded when in command of his Brigade in the Khyber and Lieutenant Hammond, R.A. mortally so, when A.D.C. to Brigadier-General Hammond, V.C., C.B., D.S.O., in the Khyber operations.

NOTE.—Total casualties during campaign of all ranks were 457 killed, 1,382 wounded and nine missing, of whom thirty-eight British and six Native officers were killed. Eighty-four British officers and thirty-six Native officers were wounded.

***NOTE* (1)** *Names printed thus* Kohar
shew Frontier Garrisons
prior to outbreaks including
posts held by the Kyber Rifles

(2) *Roads printed thus* ═══
Shew the various lines of
communication from the
Railheads to the heads of
operations.



SKETCH MAP of Disturbed portion
of the Frontier
Scale 25 Miles = 1 Inch approx.

G. F. M.

***SEQUENCE** of **RISING** on the*
Frontier & Consequent
Expeditions.

(1) ***WAZIRISTAN*** *Attack on*
Maizar Force June 97
*operations in **TOCHI***

(2) ***MALAKAND***
Attacked July 97
Punitive Exped { *July, August*
Sept 97.

(3) ***MOHMAND*** *Raid Aug 97*
Mohmand Exped. Sept Oct. 97

(4) ***AFRIDI*** *Attacks on*
Kyber Forts August 97
{ *Orakzai & Afridi Attacks*
on the Samana Forts
raids into Miranzai Aug & Sept
***TIRAH** Exped. Oct, Nov. Decr*

(5) ***CHAMKANI*** *& Neighbouring*
tribes raid Kurram Attack
Sada Sept.

(6) ***BUNER*** *Expedition*
Jany 98.

MAJOR-GENERAL SCHLUND'S CAREER IN THE BRANDENBURG, ENGLISH, PRUSSIAN, AND RUSSIAN ARTILLERY.

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CHARLES DALTON, ESQRE.

Editor of English Army Lists and Commission Registers, 1661–1714.

[The writer is much indebted to the courtesy and kindness of Lieut.-Colonel J. M. Grierson, R.A., Military Attaché at Berlin, for obtaining from the Prussian Artillery Records the interesting details of Schlund's services in the Prussian Artillery. The writer has also to thank Sir Horace Rumbolt, Bart., Ambassador to the Emperor of Austria, for his kindness in writing to a member of the British Legation at St. Petersburg, asking that a search might be made in the Russian Archives for details regarding Schlund's career in the Russian Army. Unfortunately this last named search has, so far, been barren of results. C.D.]

"QUO FATA VOCANT."

MARSHAL Schomberg's appointment as Master-General of the Ordnance, in April, 1689, induced several officers holding commissions in the Prince of Brandenburg's Artillery to transfer their services to the British army. There were two reasons for this change. The first undoubtedly was that an army was preparing for the conquest of Ireland which meant a long campaign; and secondly that this army was to be commanded by Schomberg, himself a German, who had held the appointment of Generalissimo of the Brandenburg forces. Brandenburgers were both known and appreciated in the British army. A detachment of these swashbucklers had come over with William of Orange, and being picked men, had earned the admiration of the populace. An old song, quoted by Lord Macaulay, tells us that their height and physique were vastly superior to the Duke of Berwick's Irish soldiers :—

> "Poor Berwick, how will thy dear joys
> Oppose this famed viaggio?
> Thy tallest sparks will be mere toys
> To Brandenburgh and Swedish boys,
> Coraggio! Coraggio!"

Late in the autum of 1689, two Brandenburg officers of the name of Schlund joined Schomberg's army in Ireland and were posted to the Artillery Train. The senior of the two was Captain Johann Sigismund Schlund whose chequered career it is now the writer's pleasant task to narrate. The following summary, extracted from the Prussian Artillery Records, at Berlin, gives Schlund's services from 1670–1689 :—

1671.—Joined the Brandenburg Artillery as a gunner.
1672.—Promoted Corporal.
1679.—Fireworker (Sergeant).
1685.—Transferred as Lieutenant to the 12th Infantry Regiment, "Markgraf Philipp Wilhelm."
1685.—First Lieutenant.
1689.—Staff Captain.
1689.—Transferred to the British Service—to the Artillery.

For the next twelve months we have no record of Schlund's services in Ireland but there is every reason to believe he served at the Boyne, and at the siege of Limerick, where the Prince of Brandenburg's Regiment of foot did good service. In the winter of 1690–1 it became necessary to re-organise the Artillery Train in Ireland, and from the list of the re-formed Train, "approved by General Ginkell," we find Schlund appointed Chief Firemaster with pay at sixteen shillings *per diem.* Before passing on to Schlund's subsequent services with the British Artillery let us take a parting glance at three of the officers in the Irish Train. The Commanding officer was a veteran Dutch Artillerist, John Wynant Goor, who had learnt the art of war on several hard fought battle-fields. He attained the rank of Lieutenant-General in the Dutch army and gloriously fell at Schellenberg, in 1704, leading his division on to victory. Next in rank to Goor was Jacob Richards, Artillerist and Engineer, who subsequently was appointed General of Artillery to the Venetian Republic, but retained his post of Third Engineer in England until his death in 1701. Another conspicuous officer in this Train was Holcroft Blood, Artillerist and Engineer, who commanded the British Artillery at Blenheim and died in harness, at Brussels, in 1707, as a Brigadier-General and Colonel of a British Infantry Corps (17th Foot).

The following summary of Schlund's services with the British Artillery is taken from "English Army Lists and Commission Registers, 1661–1714 (Vols. III. and IV. *passim*)":—

1691.—At the second siege of Limerick.
1692.—Appointed Major of the Flanders Train in May. and served at Steinkirk.
1693.—Served at Landen.
1694.—Served at the siege of Huy.
1695.—Served at the siege of Namur.
1696.—On service in Flanders.

The following extract from General Borgard's own diary shows how much Schlund's and Borgard's services were appreciated by the military authorities when the Peace of Ryswick necessitated the reduction of the British Artillery :—

> "1697. In the month of September, the Army marched into quarters, where the greatest part of the Artillery people

were ordered to England, foreigners excepted, who were all discharged *except myself and one by name Schlunt.*"*

In the Spring of 1698, Schlund (who is said to have been given the rank of Lieut.-Colonel in 1694)† was appointed Major of the "Peace Train," but resigned his commission the same year on being re-appointed Colonel in the Brandenburg Service and made Commander of the Artillery.‡

When the Elector of Brandenburg was crowned King of the newly constituted Kingdom of Prussia, in 1700, he undertook to maintain 10,000 men for six years, at his own charge, in the Emperor of Germany's service.§ Frederick I was a practical soldier and took the keenest interest in improving his army. At the Duke of Marlborough's request, Frederick sent Colonel Schlund with two captains, four lieutenants, eight fire-masters, sixteen bombardiers, ten gunners and six engineers to the Danube to serve with the Allied Army in the forthcoming campaign. The Prussian Artillery joined the Allies shortly before the memorable 13th August, 1704, and it is recorded that "Colonel Schlund distinguished himself at the battle of Hochstadt (Blenheim)."|| Marlborough, generally chary of praise, bears witness to Schlund's value as an artillery commander in the following letter¶ to General Thungen, who was then preparing to lay siege to Ulm:—

"Au Camp de Sefelingen, ce 26 Août, 1704,

"Monsieur,

"M. Schlundt, qui aura l'honneur de vous présenter celle-"ci, est Colonel de l'Artillerie du Roi de Prusse, que sa Majesté "nous envoie avec une brigade, selon la liste ci-jointe, pour nous assister "dans nos entreprises. C'est un officier de mérite et d'expérience, dont "je ne doute point que vous ne soyez tout-à-fait content. Quand vous "n'en aurez plus besoin, je vous prie de me le renvoyer avec ses gens, "et de leur faire fournir les chariots nécessaires et autres commodités "pour faciliter leur voyage. Je vous souhaite de tout mon coeur un "heureux succès, et suis, avec une véritable estime et passion, Monsieur, "etc.

Marlborough."

The strong fortress of Ulm, which Marlborough described, in one of his official letters, as "the chief key to the countries around it," capitulated to the besiegers after a short siege, and early in October, 1704, we find Schlund constructing batteries before the town of Landau, whilst Marlborough and Prince Eugene covered the siege with a large army in the vicinity.

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* Borgard's Diary, quoted in Duncan's *History of the Royal Artillery,* Vol. I., page 92.

† *Artillery Records,* Berlin.

‡ *Ibid.*

§ Luttrell's *Brief Relation of State Affairs,* 1678-1714, Vol. V., p. 12.

|| *Artillery Records,* Berlin.

¶ *Marlborough Dispatches,* Vol. I., p. 433.

Landau proved a tough nut to crack and Marlborough, who paid frequent visits to the besieger's camp, makes frequent reference in his despatches to the siege, the successful issue of which he had greatly at heart. As winter drew on, the sufferings of the troops in the trenches and batteries were very great. Sixty guns kept up a ceaseless fire on the doomed town. It is recorded that "Schlund constructed and commanded a battery of thirty guns at the siege of Landau.[*] In his report of this siege to King Frederick I, Prince Leopold of Dessau, who commanded, mentions "especially Colonel Schlund, who has given quite extraordinary proofs of the results of the art of gunnery."[†] Early in December, 1704, Landau capitulated and the Allied troops went into winter quarters.

Whilst these events were transpiring in Germany, Peter the Great was carrying on a war of very doubtful issue with Charles XII. Peter was still groping in the dark for military knowledge. The little band of mathematicians, gunners, skilled mechanics, and engineers who were imported into Russia, in 1698, were gradually throwing the light of science upon Russian darkness and ignorance. The energetic Tsar might have said, like Philip II of Spain: "Time and I against any other two." But with an enemy like Charles XII in the field, Peter knew that the Russian army must be re-organized with the smallest possible delay. Since the Russian defeat before Narva, in 1700, the Tsar had set himself the task of overcoming, and crushing, the power of Sweden. To a ruler who was only a soldier by necessity and had not the making of a General, the task seemed utterly hopeless; but an indomitable will, dogged perseverance, the faculty of utilising the brains of others, and a certain share of good luck, eventually established the ascendancy of Peter over his rival, Charles. It is by no means improbable that when the Tsar was in England he made the acquaintance of Colonel Schlund. It is also quite probable that it was a toss up with Schlund as to whether he entered the service of Prussia or Russia. Be this as it may, it is not surprising that the Tsar, in his thirst for knowledge, entered into a correspondence, through Prince Menschikoff, with Schlund whose scientific gunnery at Landau, and in subsequent sieges, had reached the ears of the Russian autocrat, who showed more interest for the Ordnance branch of the Service than for any other.[‡] One of Schlund's letters to the Russian Court was intercepted by the Swedes and the results of the writer's indiscretion are vividly set forth in the following extracts from the official correspondence[§] of Major-General Lord Raby (Colonel of the Royal Dragoons) the British Ambassador to the King of Prussia:—

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[*] *Artillery Records*, Berlin.

[†] *Ibid.*

[‡] Peter had his own pet "Company of Bombardiers" and served a gun himself in more actions than one! He is also credited by one of his biographers with having first introduced Horse Artillery into warfare, but this assertion is open to controversy.

[§] Letters from Lord Raby to the Secretary of State. S.P. Prussia, Vol. 12, (1706-1708). Public Record Office, London.

"Berlin, 21 May, 1707.

"The Swedish Ministers here had orders to complain of a letter of "one Colonel Schlundt, who is Colonel of the Artillery here, and who "wrote a long account of the projects of the Swedes, and advice to the "Muscovites how they should post themselves to the best advantage "in Poland, and sent them demention [dimension] of the best sort of "cannon and mortars, etc. The King of Sweden has not yet ordered "his Minister to complain of this in his name, tho' some believe he "will soon and that that unfortunate officer may be put in prison for "what he has done."

"Berlin, 28 May, 1707.

"The King of Sweden has thought fit by his Ambassador and "Envoy to complain of Col. Schlundt, whom I mentioned in my last, "and those two Ministers carried his original letter to Court, upon "which complaint to satisfie the Swedes, which is now the mode, "let them demand what they will. Our Colonel of the Artillery was "first put into confinement in his own house, and the next morning "sent with two officers (to conduct and take care of him) to Spandow "[Spandau] which is the prison for crimes of State. They hope here "this will entirely satisfie the Swedes and that they may themselves "desire no further prosecution, but I am apt to believe they will. "Let the King do what he will in the matter, who I hear has already "given commission to several officers to try him at a Council of War, "he (Schlundt) is a very good officer and served all the war in "Ireland, under the late King, my master, and when he gets his "liberty, I believe, will desire to quit this service, having much better "offers from other Princes."

"Berlin, 4 June, 1707.

"Our Col. Schlundt continues still in prison, but I am told by the "Envoy of Sweden that he believes the King, his master, will soon "desire his liberty."

"Berlin, 10 June, 1707.

"Margrave Phillip [the King of Prussia's brother] who is Grand "Master of the Artillery is come hither with his lady, and as I hear is "not sorry for Col. Schlundt's disgrace and would be glad to push the "matter so as to get him out of his employment, *to put in a favourite of* "*his,* but the Prince Royal and others design to speak to him not to "make those fresh complaints he designed against him (Schlundt) for "he is a very useful officer in the Artillery. We hear no more of the "Swedes desiring his liberty."

"Berlin, 18 June, 1707.

"The King of Sweden is so satisfied with what this King did in "imprisoning Schlundt, upon his complaint, that he will desire of His "Majesty that he may be set at liberty if the King of Prussia has "nothing else against him."

"Berlin, 18 February, $170\frac{7}{8}$.

" His Majesty has lately sent poor Colonel Schlundt to Peitz, where "the late President Dancleman was kept so long; his journey was "hasten'd thither upon the Prince Royal's (who has been always a "Patron of the Colonel's). having spoke to Colonel Schlundt at "Spandow when he passed by there 'tother day, and having assured "him he would do his utmost to procure him his liberty, and several "other kind expressions, which having been reported to the King he "is more than ever incensed against the poor Colonel for he has a "great affection for his son, the Prince Royal, yet he is very jealous "of his meddling in state affairs, tho' he permits him to meddle in "affairs of the army."

The above extract is the last reference to Schlund that can be found in Lord Raby's letters. Under the date of 1707, which may mean March $170\frac{7}{8}$ according to the old style of reckoning, the Prussian Artillery Records supply the information that Colonel Schlund was "Cashiered." Jobbery and jealousy had won the day as these two powerful motive agents so often do. Schlund was a battered veteran of thirty-seven years' service when he was imprisoned for lack of judgment but not for lack of honour. When he regained his liberty he determined like a true soldier to continue his professional career so long as his health and strength remained. He followed the only course now open to him. He offered his sword to Russia and was received with open arms by Peter the Great. Schlund was made a Major-General in the Russian army* and it is recorded that he died at Riga† which town was taken by the Russians from the Swedes in 1710. The Russian archives have not thrown any light on General Schlund's services in the Russian army but the probability is that he took part in the celebrated winter siege of Riga, which siege was characterised by the excellent gunnery of the Russian Artillery.‡

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* *Artillery Records*, Berlin.

† *Ibid.*

‡ Mr. Robert Jackson (Envoy to Sweden) to the Rt. Hon. the Secretary of State, from Stockholm, 11th December, 1709. Public Record Office.

THE CORPS OF COMMISSIONAIRES.

— BY —

LIEUT.-COLONEL A. M. MURRAY, R.A.

OWING to the stress laid by the War Office on the necessity for providing army pensioners and reservists with situations in civil life, with a view to increasing the numbers and improving the quality of recruits, the Committee of the R.A. Institution may consider the present time opportune for calling attention to the work done in this direction by the Corps of Commissionaires—the most successful of all the agencies which have been established for finding employment for old soldiers. Although full information about the corps can be obtained on application at its offices and a copy of its rules has been forwarded to every regimental head-quarters in the United Kingdom, it is yet undoubtedly the case that many men pass out of the ranks without having had the advantages of the corps brought to their individual notice. It is hoped, therefore, that the following brief remarks may assist in making the work and objects of the corps better known among the junior officers of the Regiment so that their influence may be brought to bear on their men to induce them to qualify themselves, while with their batteries, for further service as commissionaires after passing from the army.

The "Annual circular of the Corps of Commissionaires for 1898," which was published in August last, contains carefully tabulated details of the history and work of the corps since it was established in 1860, by its founder and present commanding officer, Sir Edward Walter. In that year eighty-nine men were enrolled in its ranks, each succeeding year seeing an increase in the numbers added to the corps, the total strength on the 1st January, 1898, being 2,351. The following is the distribution of this number :—

London	1539
Belfast	45
Birmingham	131
Edinburgh	57
Glasgow	130
Leeds	111
Liverpool	96
Manchester	166
Newcastle	31
Nottingham	45

In October 1897 a new division of the corps was established at Cardiff, but, owing to the coal strike, it has not as yet made much progress.

The organization of these 2,351 men is watched over by Sir Edward Walter, who exercises a close personal supervision over the work, not only of the London division, but of all the provincial divisions as well. Whether the financial prosperity of the corps as a whole is considered, or the arrangements made for the welfare of its individual members and the means for securing them provision for their old age, or the high tone and discipline which prevail among all ranks, or the testimony of employers of labour to the value of the institution, it is impossible not to be impressed by the perfection of its organization—the only wonder being that the corps is not very much larger than it is, considering the excellent results which have attended the founder's efforts. "Sir Edward Walter," wrote the Chairman of the Executive Committee in the report for 1897, "may well feel proud of the great success which has crowned his untiring energy and zeal, and the committee hope he may be able to continue for many years the good work that has proved so very beneficial to the deserving men of all branches of the Service."

The success which the corps has gained is due to the fact that it is organized not on charitable lines, but on strict business principles. The greatest care is taken in selecting candidates, each case being submitted even from out-stations for the personal decision of the commanding officer. Candidates for admission to the Corps of Commissionaires must have served in some branch of the Army or Navy, have sound health, be 5 ft. 7 in. in height, and possess a good character. Pensioners are required to pay the following fees on joining the corps, in addition to making an initial deposit of at least 10s. in the Corps Savings Bank :—

	£	s.	d.
Caution money	1	0	0
General Fund		10	0
Sick Fund		5	0
Convalescent hospital . .		5	0
Total	2	0	0

The monthly payments after joining the corps for permanent employment are as follows :—

	s.	d.
Clothing	5	6
General Fund	1	6
Sick Fund	1	6
Convalescent Hospital . .		2
Total	8	8

In addition to these payments, a minimum deposit in the Corps Savings Bank of one shilling weekly is required from each commissionaire. Reservists are required to pay the same entrance fees and monthly subscriptions to the funds, but having only a terminable pension from the State they are called on to pay increased deposits into the corps savings bank, so that they may find themselves in the same pecuniary position as pensioners when they are too old to work. Other soldiers who have completed limited engagements, or whose temporary pensions have expired, are required to deposit £20 in the savings bank before admission to the corps. Sir Edward Walter writes as follows regarding the selection of candidates:—"The admission of men is subject in all cases to my approval, and any blame or responsibility therefore in this, as well as in all other matters relating to the discipline and administration of the corps, rests entirely on myself. It is in reality the employers themselves who have fixed the standard I have adopted, and it would be of no use for me to offer them an article which they do not want, and practically to tell them what sort of man they ought to take, quite irrespective of their own fancies or requirements. If an employer asks for a man of reasonable physique which, according to our standard, means 5 ft. 7in. and upwards, it would be useless for me to offer him something quite different. He would simply take his business elsewhere." The necessity for the utmost care in selecting candidates is required by the guarantee as to character, which is given to an employer when he engages a commissionaire, and which carries with it a money security on the part of the corps, ranging from £25 to £100, according to the rank of the man and the responsibility of the position occupied. In addition to giving this money guarantee, the corps undertakes to find a substitute in case of sickness without expense to the employer. Since every commissionaire on admission is required to subscribe to the Sick Fund and Savings Bank, thus ensuring for himself and family an ample provision during illness and in old age, the employer is relieved of any hesitation he might otherwise have in discharging a man who might fall sick or grow too old for his work. The mutual advantages conferred by this system on both employer and commissionaire are very great and have largely contributed to the success of the organization.

What Sir Edward Walter asks for from candidates seeking admission into his corps is not so much skilled labour, which can always find employment, as reliable character, industrious habits and self-respect —qualities which can be specially brought out and developed by military service. Given these conditions on the part of the men he can find almost unlimited employment for them as night and day watchmen, clerks, time and gate keepers, messengers, gymnastic and drill instructors, boatmen, and porters for every description of light and heavy work. An authorized scale of wages has been drawn up both for permanent and temporary employment, but this does not preclude special engagements being made by employers with the men themselves on terms settled by mutual agreement.

For the convenience of employers and to promote uniformity of system throughout the corps, the following scale of wages has been authorized for the different classes of commissionaires in permanent and temporary employment in the Metropolis and principal manufacturing towns:—

Permanent Employment.		Temporary Employment.		
	per week.		per day.	per half day.
Sergeants	£1 8s. 0d.	Sergeants	6s. 0d.	4s. 0d.
Corporals	£1 6s. 0d.	Corporals	5s. 0d.	3s. 6d.
Commissionaires	£1 4s. 0d.	Commissionaires	4s. 6d.	3s. 0d.

The above tariff does not apply to commissionaires of special attainments and education, whose salaries would range from 30s. to 50s. a week. Nor does the printed standard of normal wages preclude engagements between employers and commissionaires on such terms as may be found mutually suitable.

The real cause why the corps, which is organized on so excellent a system has not grown to larger proportions, is not the want of employment, but the difficulty in obtaining men who come up to the standard necessarily required from those who are enrolled as commissionaires. As Sir Edward Walter points out in his report for last year "there is employment in London alone for 50,000 commissionaires, and if retired soldiers and sailors will qualify themselves for the best situations, they will undoubtedly get them." This statement comes as a rather startling surprise in view of the complaints made so frequently that employers will not take old soldiers into their service. It brings us face to face with the cause why so many old soldiers pass their time in tramping the roads and end their lives in the workhouse. With such organizations in existence as the Corps of Commissionaires, the Army and Navy Pensioners' Employment Society, and the National Association for the Employment of Reserve Soldiers, there is no reason whatever why any reservist or discharged soldier should not be able to earn an honest living and provide for his old age if he is determined to do so. No organization, however, will provide work for idle and useless men, who will not help themselves, and it is to be feared that the large proportion of ex-soldiers who doom themselves to the life of tramps belong to this class.

The remedy would seem to be found, not by appealing to the patriotism of employers to engage men who are not worth their wages, but by efforts as far as possible to improve the men while still serving in the Army, and to train them to habits of regular work, thrift and industry. With this object, it becomes a necessity to impress on recruits as soon as they join that their army service should be regarded as a period of preparation for their future duties when they return to civil life. If this view of their life in the Army is kept conspicuously before them from the first, there will be a definite inducement to them throughout their service to train themselves to habits of discipline, thrift and industrious conduct. It is too late to put into a man's hand just as he is leaving the Army information regarding employment, which the experience of the previous seven years of his life has not qualified him to undertake. From the first he should be confronted with the responsibility of his future career after passing from the Army into civil life. Education is a great factor in the development of character. Recruits from their first day's service can be urged to take advantage of the opportunities offered in the Army for improving their educational knowledge. Sir Edward Walter, who has had forty years experience of the management of old soldiers and sailors, sets great value on educational qualifications and never refuses to admit into his corps men who have obtained first class certificates of education. It is to be hoped that his circular* will reach every battery in the Regiment and be the means of making men acquainted with the value of an institution, which, under the conditions described, will provide them with work as long as they can do it, as well as enable them to make comfortable provision for themselves and families in their old age.

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* Copies of the "Annual Circular" can be obtained gratis on sending a written application to the Commanding Officer at the head-quarter office of the corps: Exchange Court, 419, Strand, London, W.C.

THE RUSTING OF IRON AND STEEL.

— BY —

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Secretary to the Chemical Society and Director of the Scientific Department of the Imperial Institute.

(Summary of a Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday 24th Feb., 1898.)

Colonel E. Bainbridge, c.b., R.A., in the chair.

IT is well known that a piece of iron or steel exposed to air soon becomes covered with a reddish crust, which involves a corrosion and gradual eating away of the metal

This reddish crust, rust, is essentially an oxide of iron containing combined water, practically identical with the well-known jeweller's rouge, which is nearly pure ferric oxide Fe_2O_3. The ordinary chemical explanation of the process is that the iron, having a great affinity for oxygen, combines with the oxygen of the atmosphere, and thus rust is formed, the change being expressed by the chemical equation $2\,Fe_2 + 3O_2 = 2\,Fe_2O_3$, or if the combined water be taken into account

$$Fe_2 + 3\,O + 3H_2O = Fe_2O_3,\ 3H_2O.$$

Scientific chemists, however, are aware that there are certain circumstances connected with rusting which indicate that the action in reality is not so simple as these equations represent. It has been known for many years that if iron is placed in contact with alkalis it does not rust. The explanation which has been suggested, and generally accepted by chemists, of this peculiarity, is that carbonic acid gas (CO_2) is intimately concerned in rusting; in fact it has been asserted that without carbonic acid gas (which is present in air) rusting cannot occur. Alkalis, by absorbing and removing carbon dioxide, prevent rusting. This, as I have said, is the generally accepted view of the chemistry of rusting, which has been summarized by Professor Crum Brown, by the two following equations:—

$$(1).—4\,(Fe + H_2O + CO_2) = 4\,FeCO_3 + 4\,H_2.$$

$$(2).—4\,FeCO_3 + 6H_2O + O_2 = 2\,Fe_2\,(OH)_6 + 4\,CO_2.$$

A few years ago I determined to investigate more closely the conditions necessary for the rusting of iron, as the experimental evidence recorded in favour of the current view seemed to me very insufficient, and the whole question appeared to be one of interest and importance.

I propose to-night to give you a short account of some of the conclusions at which I have arrived and of the principal evidence I have accumulated in support of them. The final result of the process we call rusting is, undoubtedly, oxidation; the question is as to the manner in which it is effected.

In dealing with this question, pure iron was heated in a current of hydrogen to remove any oxide on its surface, and the oxygen or air employed was highly purified. There are two possible sources of the oxygen which enters into combination, one is the free oxygen of the air, the other is the combined oxygen of water always present in air. To show that the oxygen may be derived from either of these sources, I propose to make two experiments.

To show that iron combines with oxygen gas, I shall heat the metal in oxygen, when it oxidises with great violence. Finely divided iron will take fire in air at the ordinary temperature.

Iron can also, under certain circumstances, abstract oxygen from water. When heated with the vapour of water (steam) the oxygen is removed and the hydrogen of the water set free. With these two possibilities in view, experiments were made by enclosing pieces of bright iron in glass tubes under the following conditions:—

(1). With dry oxygen. ... ... Result: no rusting.
(2). With water vapour only. ... ,, ,,
(3). With liquid water only. ... ,, ,,
(4). With oxygen and water vapour. ,, ,,
(5). With pure oxygen and liquid water. ,, rusting.

Rusting is thus shown to occur only when iron is in contact with oxygen and *liquid water*; every care was taken to exclude carbon dioxide, which therefore plays no necessary part in the rusting process. But this conclusion seems to be contradicted by the well-known fact that iron rusts in ordinary air out of contact with liquid water. This, however, is really no contradiction, since if the temperature of the air is constant, no rusting takes place. Rusting only occurs when, owing to a falling temperature, water is condensed as a liquid film or dew on the surface of the iron. This I can make clear by the experiment in progress before you. Two pieces of bright iron are suspended, one in the glass chamber of constant temperature over a dish of water, the other in the outer air where the temperature fluctuates. After sixty hours exposure, we find that the metal in the chamber is untarnished, whilst that outside is covered with little spots of rust—the spots corresponding with the globules of deposited dew.

It is thus clear that liquid water and oxygen being necessary for rusting to occur, the oxygen may be taken from one or both these sources. It was thought that some further light might be thrown on this subject by examining the influence exerted by certain metallic salts on the formation of rust. The action of a large number of soluble salts not directly attacked by metallic iron has been examined. Some were found to accelerate or to produce no effect on rusting. Among salts of this class may be mentioned, sodium chloride, sodium sulphate, ammonium sulphate, magnesium chloride, magnesium sulphate, potassium chlorate, calcium chloride, and calcium sulphate. Certain salts, however, either greatly retarded or altogether prevented rusting of iron. Among these may be named, sodium carbonate, sodium hydroxide, sodium phosphate, sodium borate, ammonium carbonate, sodium nitrite (partially), calcium hydroxide, and barium hydroxide.

A consideration of the two facts that liquid water is necessary for rusting, and that all salts having an alkaline re-action prevent it, suggested the possibility of hydrogen peroxide (H_2O_2) being concerned in the process. This is an unstable substance, acting as a powerful oxidising agent, which is only formed in presence of liquid water and is decomposed by alkalis. Experiments were next tried to ascertain whether all substances which decompose hydrogen peroxide, and would therefore stand in the way of its formation, will also prevent the rusting of iron. The action of the following substances was therefore tried, potassium bichromate, potassium chromate, potassium ferrocyanide, and sodium nitrate, with the striking result that in all cases rusting was either entirely or nearly entirely prevented. The inference that the hydrogen peroxide is in some intimate way concerned in rusting is thus greatly strengthened, especially by the action of the potassium bichromate, which, as itself an oxidising agent, might be expected to assist the rusting of iron; this substance is, however, powerfully destructive of hydrogen peroxide. In order to illustrate the action of these salts in promoting the decomposition of hydrogen peroxide, I will make one experiment by taking a dilute solution of hydrogen peroxide and mixing with it a solution of potassium ferrocyanide when almost immediately the peroxide begins to break up into oxygen and water.

The direct action of hydrogen peroxide on iron is remarkable in at once giving an oxyhydroxide of iron identical with rust, as you will see from the experiment in progress, whilst when iron is oxidised under other conditions, another oxide—the magnetic oxide—is usually produced. The rust formed from pure iron is remarkably uniform in composition as is seen from the analysis recorded on the diagram. Its composition may be expressed by the formula $Fe_2O_2\ (OH)_2$ and it is a curious coincidence, if nothing more, that this is equivalent to $2\ Fe\ O + H_2O_2$.

I consider that the results of these experiments justify the conclusion that hydrogen peroxide is intimately concerned in the aerial oxidation of iron, and that substances which prevent the formation of hydrogen peroxide also prevent rusting. If this is true, it seems probable that unless a metal is capable of being oxidised by hydrogen peroxide it will not rust.

Further experiment has completely confirmed this inference. Those metals rust in air which are oxidised by hydrogen peroxide, whilst those metals which are not oxidised by hydrogen peroxide do not rust in air. Iron, zinc, and lead are examples of the first-class, and the rusting of all of these metals is stopped by contact with substances which prevent the formation of hydrogen peroxide. Copper, silver, and nickel are examples of the second class. These metals do not rust in air and are not oxidised by hydrogen peroxide. I may show at this point an experiment proving that copper is not appreciably oxidised by hydrogen peroxide, and, as is well-known, this metal scarcely oxidises or rusts in air.

Another interesting experiment I may show now was suggested by the question what would happen if a piece of iron is immersed in a solution of hydrogen peroxide, made just alkaline, so that decomposition of the peroxide occurred very slowly at the ordinary temperature. It seemed improbable that rusting would occur and yet some action seemed likely when the metal is actually in contact with the hydrogen peroxide. What actually happens, as you will see is, that the entrance of the iron into the alkaline solution causes the immediate decomposition of the hydrogen peroxide into oxygen and water and the oxygen is seen escaping at the surface of the iron, but yet is powerless to combine with the iron to form rust.

I am now naturally brought to the question as to the exact nature of the chemical process of rusting, which is evidently more complicated than has hitherto been supposed. I refrain on this occasion from discussing the several chemical changes which suggest themselves as possible, but will at once say that after a thorough investigation of these different actions, I have come to the conclusion that the change that occurs is one in which the iron in the first instance takes oxygen from a molecule of water forming ferrous oxide, setting free the hydrogen, which joins itself to a molecule of oxygen, forming hydrogen peroxide, and this immediately combines with the ferrous oxide forming "rust." The principal action is represented in outline by the following equations:—

$$Fe + OH_2 + O_2 = FeO + H_2O_2$$

$$2\ FeO + H_2O_2 = 2\ FeO\ (OH)_2$$

It can hardly be doubted that the action is partly, if not wholly electrical, in its origin, as indeed we believe all chemical changes are fundamentally, and it is worth noting in this connection that, if metallic iron is made the positive pole of an electrolytic cell of water, "rust" is rapidly formed on the surface of the metal, as you see in the experiment now proceeding on the table.

I now turn for a few moments to the rusting of steel, which as is well-known, rusts less readily than pure iron. Steel is made by the addition of carbon to iron, so that more or less (from ·2 to 2 per cent.) enters into combination with the iron forming a carbide probably having the composition Fe_3C. Steel, therefore, may be regarded as iron, which holds in solution, or intimate association, carbide of iron, the hardness chiefly depending on the quantity of carbide which is present. Recently the exact structure of steel has been made evident by photographing the surface highly magnified. The steel is then found not to possess a uniform structure, and the metallic iron may be seen imbedded, often in distinct veins, in the mass of the carbide. This is well shown in the photograph which I will throw on the screen of a highly polished steel surface magnified 140 diameters. The metallic iron appears white and the carbide black. It was interesting to ascertain how these two components behave during rusting. The next photograph of the same piece of steel tells its own story. The pure iron has been attacked and the falling away of the rust has left furrows in the surface. The carbide is little if at all "rusted." I will now show you a photograph of another piece of the same steel, highly polished, in which the oxygen and carbide are more evenly distributed, and another photograph of the same piece of metal after it has rusted. The corrosion is in consequence more general and the furrowing is not noticeable. Photographs of steel which have been immersed in hydrogen peroxide show that the attack has been on the iron (ferrite), scarcely at all on the carbide, there being an exact parallelism between aerial oxidation or rusting of steel and the action of hydrogen peroxide on the same metal. This mode of rusting of steel has an important bearing on the corrosion, and consequent loss of mechanical strength, in railway lines and other steel structures. From an examination which I have recently made, of the mode of rusting of a large number of sections of steel rails, it appears, as you have seen, that the rusting may occur uniformly over the entire surface, and this happens when the two constituents of steel are distributed uniformly throughout the mass of metal, or furrows may be formed in those cases where large veins of pure iron occur in the mass leading, in the case of railway rails, to a rapid deterioration and wearing away of the surface. In the metallurgy of steel regard therefore ought to be paid to those conditions which lead to a uniform distribution of the two constituents. In future, it seems probable that the examination of the micro-structure of steel will be considered to be a necessary adjunct to its chemical analysis.

In this lecture I have endeavoured to give you some account of the new view about the rusting of iron and steel, and I think you will agree with me that the results have practical importance as well as scientific interest, as throwing some light on what has hitherto been regarded as one of the simplest and most important of natural chemical processes.

DISCUSSION.

Professor McLeod: I shall be very glad to make a few remarks upon this interesting subject which Professor Dunstan has brought before us and in which I think he has proved his point to a large extent, that the cause of rusting is the formation of peroxide of hydrogen. But I think he has left out one or two facts that will support his theory.

In the first place I think I am right in saying that when zinc and water are brought into contact there is actually produced peroxide of hydrogen; there we have an evidence of the formation of this peroxide of hydrogen which according to Professor Dunstan's theory is the precursor of the oxidation of iron. It is difficult or perhaps impossible to detect the presence of peroxide of hydrogen when iron is rusting, because, as Professor Dunstan has shown us, directly peroxide of hydrogen in an alkaline solution is brought into contact with metallic iron you have decomposition of the peroxide of hydrogen.

Another point that Professor Dunstan touched upon, but rather doubtfully, was whether electrolysis had anything to do with rusting. I think that his experiments distinctly prove that electrolysis is one of the great and most important facts connected with the oxidation. For example, in the case of those bodies which are inactive in preventing oxidation or rather which accelerate rusting, their presence would improve the conductivity of the water, electrolysis would take place more rapidly, the current would pass more rapidly through a solution of these salts than through pure water and therefore there would be a hastening of the oxidation.

The fact of the necessity of liquid water to start or maintain the rusting is very certain and there are many facts which prove this; you will all know that after a dewy night bright railway rails which have been used on the previous day are covered with a thin coating of rust which is formed no doubt in consequence of the decomposition of the small quantity of dew on the surface of the iron. I had a remarkable instance of this in my own house some little time ago; I had a Wenham burner which was not burning properly, the ventilator from it was apparently stopped; on opening the outside casing which surrounded the iron tube which carried off the products of combustion, we found that near the burner the iron was in perfect condition but a few feet away and near the chimney into which the pipe enters the iron was entirely corroded away. It was not the place where we might have expected it, where the temperature was high and there was more chemical action, but it was at the place where the temperature was low and where the water vapour produced by the combustion, would have been deposited.

Then there is another point that Professor Dunstan did not mention and which I think rather supports his theory. Many years ago, when I was assistant to Professor Frankland at the Royal Institution, I was well acquainted with the cubes of iron and steel which Faraday had placed in different solutions and some years after that I put up a number of specimens myself, which Professor Dunstan has seen; and on looking at these after their having stood there for some years, on just shaking the bottle one found curious dark streaks which looked like ferrous oxide being transformed through magnetic oxide into ferric oxide. Now ferrous oxide, according to Professor Dunstan, is a precursor of the formation of rust and therefore this greenish deposit is still further in support of his doctrine.

I must say that I myself feel very much convinced that Professor Dunstan is perfectly right in saying that peroxide of hydrogen is connected with the subject but I should like to ask him one question, the reply to which I shall not however be able to stop to listen to, and that is whether he has analysed the oxide of zinc formed by oxidation of zinc in contact with peroxide of hydrogen. ?

The stopping of rusting of iron by a powerful oxidising agent such as chromic acid is very remarkable. You have there a body which is very likely to give off oxygen to anything that will combine with it, and yet the piece of polished steel or iron remains bright in a strong solution of chromic acid. I thought when Professor Dunstan first told me of it that it would be an excellent question to set in Examination Papers "What is the action of chromic acid upon iron," and I remember asking a celebrated chemist what would happen? He entered into a long disquisition about forming chromic oxide and chromic chromates, and when I told him that no action at all takes place he was very much surprised.

Professor TILDEN : It is very good of you, Sir, to allow me to join in an expression of great pleasure at the interesting discourse that we have listened to this afternoon. I entirely agree with Professor McLeod that Professor Dunstan has gone a long way towards establishing his proposition. At the same time I feel, as I suppose Professor Dunstan will be the first to admit, that the investigation is not yet quite complete. I am not quite clear indeed from what he said whether in bringing forward what appears to be a perfectly efficient theory of rusting he intends it absolutely to displace the old theory in all cases, or whether he would still allow that in some circumstances a solution of carbonic acid and oxygen alone would be competent to act upon iron. I was quite surprised to hear that carbonic acid actually gave rise to the evolution of hydrogen, and when Professor Dunstan shewed us the powder stirred up in carbonic acid and water I wondered whether he had taken the trouble actually to ascertain whether it was really hydrogen gas. The notion I have always had about the action of carbonic acid is that it co-operated with oxygen and I should not have expressed the action by the equation which is first written down on the diagram and which is attributed to Dr. Calvert and Professor Crum Brown. I should have preferred to add to the first equation "oxygen" which would result in the formation not of hydrogen but of water. I should have thought that carbonic acid alone was scarcely competent to produce ferrous carbonate. However, this is a point which Professor Dunstan has probably already investigated.

I have never myself studied specially the question of the rusting of iron but I devoted some considerable time a few years ago to the somewhat kindred investigation of the action of water and air and dissolved salts upon copper and copper alloys and I learnt a number of facts from the investigation, which were shortly afterwards published in the "Journal of the Society of Chemical Industry," and which seemed to bear to a certain extent upon some of the points which Professor Dunstan has raised to-day. For instance with regard to the influence of these salts, among other agents that I made use of was a solution of common salt, Sodium chloride. I compared the action of Sodium chloride with that of Magnesium chloride, which I quite expected would have been much more effective as the corrosive agent; to my surprise the common salt acted more efficiently than the magnesium salt in the form of solution in water and this, after a little consideration, it was not difficult to explain. What happens really is that atmospheric oxygen in contact with the Sodium chloride gives rise to a separation of the alkaline metal sodium in the form of oxide, while the chlorine of the chloride attacks the surface of the metal, and that salt was found to be most efficient which contains the metal which is most positive, that is to say which tends to combine oxygen most energetically, and I imagine that some other salts in that table on the wall would perhaps act in a similar way.

I also found unquestionable evidence of the electrical influence of the substance which is formed as the product of the rusting on the surface of the metal, provided that it remains in a solid form attached to the metal; that is to say oxychloride or oxy-carbonate or whatever it was, in fact what people call verdigris, in the presence of and contact with the copper tends to the further development of the same action; and I wonder whether Professor Dunstan has considered whether it is not probable that rust in contact with iron forms a voltaic couple which may result possibly in the slow decomposition of the water. Oxide of iron is certainly capable of acting negatively towards the metal which remains unrusted and I suppose it is quite certain that when once a metal has begun to rust the process goes on at an accelerated rate.

There is one other little point that arises out of Professor Dunstan's reference to the peculiar local action that is noticeable upon some of the surfaces of metal that he has shown us. In connection with copper alloys, I have observed one curious fact, which is that if a sheet of such metal, brass or bronze, be distorted, if it is bent or if it is perforated by a punch or anything of that kind, the part which is thus distorted is the first to be attacked. A plate of bronze, for instance, in its ordinary flat condition as it comes from the mill if it were immersed in various corrosive substances would resist the action for a long time but if it was simply bent across and placed into solution it would proceed to corrode to a great extent and I think it is possible that in the case of iron something of the same kind may occur. These sheets are sheets, not of chemically pure iron, I am not quite sure whether they are steel or wrought iron; but at any rate they have been milled in the ordinary way and they necessarily have a grain of some kind, and I think it is that slight difference of texture which in some kind of way gives rise to the very curious effects that are noticeable.

I listened with a great deal of pleasure to what Professor Dunstan has said; I feel that I have learnt a great many things this afternoon and I wish him well in the prosecution of his inquiries. At the same time before I begin to teach his theory to my pupils I must feel quite sure that I am on safe ground and I want to know whether he actually throws over the old theory altogether or whether he would still allow that it is occasionally operative.

Mr. Webster: With regard to the oxidation of iron and other metals, I have had considerable experience, I have especially used wrought and cast-iron plates in the purification of contaminated water and sewage, these plates being used as electrodes. The quantity of impure liquid acted upon at different times represented a town of from 2,000 to 5,000 inhabitants with the usual English Manufacturer's waste products the experiments lasted several years and some sixty tons of iron plates were oxidised or used up. I am still carrying out experiments in my laboratory and have verified the old work which was absolutely accurate when properly carried out. I was unable to personally superintend any experiments in 1891–2–3, owing to long continued illness. The analysis of the first experiments, done by the opposition, were, I am sorry to say, "faked" and only a few months ago I received a confession to that effect but the analysis of Sir Henry Roscoe, F.R.S., Mr. Fletcher, F.I.C. etc., (who was then Chief Inspector for the Rivers' Pollution Act for Scotland, and Alkali Act for England, Mr. Midwinter, F.I.C., F.C.S. (Analyst for Windsor) Mr. Carter Bell, F.I.C. (Analyst for Salford) Mr. Burkhardt, (Consultant for Salford) and others absolutely corroborated my original statements as to the oxidation of iron electrolytically producing the purification which prevented putrefaction. This was at the time further corroborated by experiments carried out in Paris at Pasteur's Laboratory.

My experience with regard to the oxidation of iron is, that in the negative condition it does not oxidise and that even at such a low potential as 0·9 volts, iron electrodes decompose water, the usual potential being 1·5 volts.

Professor John Hopkinson, F.R.S., who was my consulting Electrical Engineer in 1888–89 was surprised when I explained this phenomenon; and after his experiments came to the conclusion that oxidation of iron in impure liquids undoubtedly did its work. In the case of decomposing vegetable and animal matter in solution carbonate of ammonia is formed and the iron is more easily oxidised.

All sewage and impure water contain chlorides and in consequence the iron electrodes require much less E.M.F. to become oxidised; at the positive electrode the hypochlorite of the metal is undoubtedly formed but being an unstable salt it quickly becomes a chloride, or as is more probably the case the chlorine attacks the organic matter and sets free the metal, which as the negative electrodes give alkaline products of decomposition becomes ferrous oxide; where carbonates are present ferrous oxide and carbonate are produced. If the resulting solution of these ferrous salts is mixed with hydrated ferric oxide the ferrous oxides become ferric; there are other re-actions which take place by modifications of the process which also produce the ferric condition. The ferrous solution or effluent absorbs the oxygen from the air and thus becomes ferric—in which condition it is impossible for putrefaction to take place.

The ferrous oxide in the green and white condition has the property of combining with dissolved organic matter and precipitating it; to get the various results the liquid acted on must be in motion, i.e. running through the electrodes. In reference to the ferrous carbonate in solution which Professor Dunstan has shown you in aerated water—I took my first patent out in 1887–8, and three years ago I took a fresh patent for producing nascent ferrous carbonate electrolytically both for immediate use and for storage. Mr. Moore, F.R.C.S., carried out experiments on patients with extraordinary results and I have also done the same, finding that one-tenth grain dose of ferrous carbonate is ample. I agree with Professor Dunstan that medicos are not enthused with the idea of a new chalybeate, but I am pleased to say that I am making arrangements for it to be exhaustively tried in two hospitals.

I have also noticed with regard to the oxidation of wrought iron plates that they do not oxidise homogeneously but flake after a time; this is partly due to magnetic oxide on the surface, known as Blacksmith's oxide, and also to molecules of carbon on the surface. With common cast-iron run into sand-moulds direct from furnace the oxidation is homogeneous.

I should like to ask Professor Dunstan whether he has tested the re-action of carbonic acid on granulated iron as I should like to know whether it is the white ferrous oxide or not, that is produced? personally I have not tested it. Mr. Scudder, (Sir Henry Roscoe's Assistant) told me of this production of ferrous carbonate when granulated iron, or iron filings, were placed in a solution of carbonic acid, in the year 1890 when I believe he was experimenting with this re-action in connection with investigations on my sewage process at Salford.

I have seen ferrous oxides produced in the presence of carbonic acid by electrolysis which on being tested showed no trace of ferrous carbonate. I beg to congratulate Professor Dunstan on his most instructive lecture.

The CHAIRMAN :—I am afraid that like the rest of the officers in the room I feel too diffident in the presence of so much talent as we have here to-night to ventilate any ideas of my own; but I read a statement the other day in a book as to the amount of injury done by rust and I do not know whether it is true or not; it is that the London and North Western Railway Company lose eighteen tons of metal daily from their rails on their whole system by wear and rust and I suppose that the greater part of that is due to rust—that the wear comes from rust.

REPLY.

Professor DUNSTAN :—I am sorry that Professor McLeod has been obliged to go away before I was able to reply to his question. He has known of my experiments for some time and therefore is in a good position to discuss certain points.

He began by saying that zinc and water when in contact form hydrogen peroxide. That is true, if oxygen is present to a minute extent. There are many facts that I could not include in this lecture and other facts have been established during my work which I have not mentioned. I may say that it can be shown that if you shake zinc and certain other metals with water and oxygen you do get evidence in certain cases of the formation of hydrogen peroxide; but in most cases there is no hydrogen peroxide to be detected at all, certainly not in the case of iron. As Professor McLeod has remarked, it is true that the hydrogen peroxide can scarcely exist for a second in the presence of iron; directly the iron is immersed in a weak solution it decomposes the hydrogen peroxide so fast that it is hardly to be expected that you would be able to detect it.

It is true, that I spoke cautiously about the probable electrolytic nature of this process and it is not quite so clear as he seemed to think. We appear to have practically no second electrode. It is rather unusual to have a metal acting as one electrode and a gas acting as the other and oxygen negative to the iron. I think there is a great plausibility about it, but I spoke with some caution because it is a view that runs contrary to our common notions about electrolysis and it would need many more facts to prove that it was really electrolysis in the ordinary sense.

Then Professor McLeod referred to the deposits of rust on some pieces of iron which he has kept in solution for a very long time,—I think he told us they were put in water in a solution of sodium chloride so long ago as 1863, and there he noticed in certain cases the greenish black stain. I may say that it is very difficult indeed under ordinary circumstances to detect the early formation of any ferrous oxide in the process. I have never succeeded in convincing myself that it can be detected; but it is found if the action has gone on for some time, and it is always noticed on the surface of the iron which is below the rust; you have a layer of rust formed on the surface of the metal and you generally find that after a time some ferrous oxide has been formed at that point. It may be due, of course, to the reduction of ferric oxide by the metal itself, I do not think it is at all clear that the greenish stain he noticed is the first formed ferrous oxide of my equation; I think it is much more likely that it is the result of reduction of the rust which has been lying in contact with the metal.

Basic zinc hydroxide is formed when hydrogen peroxide acts on zinc.

There is one other point that Professor McLeod referred to, to which he said I did not allude, namely, the support that my theory gains from the fact that sodium chloride and sulphate and other salts accelerate rusting. That may indicate, as he supposes, that the process is electrolytic. On the other hand some of these salts that prevent rusting also assist electrolysis and it is not yet proved that all sorts which in solution are good conductors accelerate rusting.

Professor Tilden has asked me an important question, whether the old theory of rusting is to be thrown over altogether. I should say that so far as ordinary rusting is concerned undoubtedly it must be because carbonic acid gas is not necessary for rusting to occur. Ordinary rust, on analysis, contains a very small amount of carbonate and under ordinary conditions the part played by carbonic acid gas must be, I think, comparatively small. I think the amount of the effect which is produced by carbonic acid gas contained in the air is very small indeed as compared with the amount of action which is going on under the conditions summarised in these equations. The correct statement is that carbonic acid gas is not essentially concerned in the process of rusting. Water that has been exposed to air contains carbonic acid gas and that assists the process of rusting, in the way summarised by the equations of Professor Crum Brown; but rusting goes on quite well in the absence of it and I think there is hardly any doubt that the main effect must be attributed to the kind of change I have indicated.

I accept Professor Crum Brown's view that when iron is put into contact with carbonic acid gas ferrous carbonate is formed and hydrogen given off; and I believe that there are a number of statements by different observers to the same effect. On the other hand, if we suppose that hydrogen is not given off, and that oxygen (as Professor Tilden supposes) should be included in the first equation, I think it would be difficult to explain the considerable amount of iron that goes into solution in ordinary aerated water. The amount of oxygen contained in ordinary soda-water, charged under pressure, is too small to account for it.

Then Professor Tilden alluded to another point, which I should perhaps have mentioned in the lecture, because what he said was perfectly correct and it is an important fact to bear in mind, namely, that when once rust has been formed the further action goes on much more quickly; and there is no doubt that metallic iron and rust do together form a couple and something in the nature of ordinary electrolytic action occurs ; but I have never been able to detect the production of any hydrogen under these circumstances.

He also referred to the curious figures which are produced on the surface of iron in rusting, indicating irregularity in the attack of the oxygen, and he mentioned that in the case of brass he had found that if the metal was bent it was attacked much more at the point where the bending occurred. I am not at all certain that a similar examination will hold good with regard to iron; at any rate the following experiment has been made. Pieces of pure iron have been filed in various places on the supposition that where the surface was roughened the rusting would go on more rapidly. As a matter of fact it did not; in several cases it avoided altogether the part which had been filed and commenced on the smooth surface. So that evidently there is more to be ascertained with regard to the origin of the action. The specimens of iron that you see in these bottles are not pure iron and are only intended to illustrate the kind of action; but the principal experiments have been made with nearly pure iron,—that is if I may call iron pure which has been proved to contain not more than 0·05 $^{0}/_{0}$ of impurity. With such iron you still get this curious selective attack; you still get the curious figures that you noticed on the surface when ordinary iron was immersed in water and exposed to the air. It may possibly be due, as Professor Tilden has suggested, to the texture of the metal.

I was interested to hear what Mr. Webster had to say about his experiments on the purification of sewage by electrolytic process with iron as an electrode. He has asked me whether the iron dissolved in the carbonic acid gas is a carbonate. I think undoubtedly it must be, because if you pass oxygen, as we have done here, through the solution, it is found that the sediment of rust contains a considerable quantity of carbonate and oxide in combination, and if that solution evaporates in the air it behaves as you would expect ferrous carbonate to behave. I do not think there is any evidence that it is merely the hydroxide of iron which dissolved.

Colonel Bainbridge's statement with regard to the wear of rails is approximately correct. It is a very important matter to find out under what conditions steel rails rust and to ascertain how they should be treated in the manufacture so as to lead to the least amount of corrosion. When once the surfaces have begun to rust then, of course the corroded material is soon removed from the surface and the process goes on and one can readily understand how a large amount of metal may be lost.

The CHAIRMAN :—Ladies and gentlemen, it now only remains for me to ask you to join with me in thanking Professor Dunstan for the very interesting lecture he has given us to-night and also in thanking the gentlemen who have so ably joined in the discussion (applause).

Professor DUNSTAN:—I only wish to thank you very much for the attention with which you have listened to the lecture and the interest you have shown in the subject to which it relates (loud applause).

THE EASTERN SOUDAN.

— BY —

COLONEL C. S. PARSONS, R.A.

(*Chief Staff Officer, Woolwich District*).

(*A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday, 20th April, 1899*)

MAJOR-GENERAL J. F. MAURICE, C.B., IN THE CHAIR.

[The Secretary, R.A.I., by direction of the Chairman, read letters and telegrams of apology and regret for unavoidable absence from General Sir F. C. A. Stephenson, G.C.B., *late* commanding the Forces in Egypt, and from the following officers who had taken part in the Khartoum Expedition of 1898:—General Sir A. Hunter, K.C.B., D.S.O., *late* commanding Egyptian Division; Major-General Sir H. M. L. Rundle, K.C.B., C.M.G., D.S.O., R.A., *late* Chief of the Staff; Major-General Sir W. F. Gatacre, K.C.B., D.S.O., *late* commanding British Division; Commander Colin Keppel, C.B., D.S.O., R.N., *late* Commander of the Nile gun-boat flotilla; Major-General Hon. N. G. Lyttleton, C.B., *late* commanding 2nd Brigade British Division; and Lieut.-Colonel H. M. Lawson, R.E., who commanded the Arab levies.

THE CHAIRMAN:—Ladies and Gentlemen, it is hardly necessary for me to introduce to you Colonel Parsons, Royal Artillery, whose name was so prominently before the public a few months ago as the Governor of the Eastern Soudan and Commander of the Egyptian forces at the capture of Gedarif and in the subsequent operations in that part of the country, and who is now my Chief Staff Officer in the Woolwich District. I will therefore ask Colonel Parsons to kindly deliver his lecture.

Description of the map.

Colonel PARSONS:—General Maurice, ladies and gentlemen, before commencing the subject of the Lecture, I venture to draw your attention for one moment to this rough map of the Eastern Soudan which is not, I fear, sufficiently clear to be visible from the back seats. It shows the Nile running down from Fashoda to the 3rd cataract, below Dongola; the eastern fork represents the Blue Nile. The Atbara runs into the Nile south of Berber. Traversing the north-east quarter of the map is the Khor Baraka. The dotted line thus —-—-

represents the frontier between Eritrea and the Egyptian territories running from the Red Sea in a south-westerly direction, and then to Tomat immediately south of El Fasher. The frontier south of El Fasher is not defined, and is the subject of negotiation between the Italian and the Abyssinian Governments.

Climate. As regards the climate of the Eastern Soudan, it is similar to that of the Soudan generally, excessively hot by day with a breeze by night, rendering sleep possible; it is not so on the Red Sea, where at places like Suakin and Massowah, the nights during July, August and part of September are almost unbearable. The nearest sanatorium I know of is in Eritrea, at Asmara, 8,000 feet above the sea, and at Keren. The climate of this part of Eritrea is very much like the climate of Switzerland.

Sport. Officers have often asked questions regarding sport in these regions. Moving from place to place we came across giraffe, ostrich and bustard. Lions and leopards were reported in the Barea country. I think they *were* there because the natives were so continually offering their skins for sale.

History of Kassala. With reference to the Eastern Soudan generally, the most important town in it is undoubtedly Kassala, and it is important for two reasons. Firstly, its central situation. If you take Kassala as a centre and draw a radius you can describe a circular figure passing through Omdurman, Berber, Suakin, Massowa and the south portion of Gedarif Province at Rosaires. All these places are more or less important. The Arabs go so far as to say that you cannot get anywhere into the Soudan without going to Kassala. Secondly, on account of the extreme fertility of the soil of the surrounding neighbourhood. Round Kassala there is a network of wells, and in the rainy season the Khor Gash fed with rain water from the Abyssinian Mountains inundates the district.

During the last twenty years Kassala has had a momentous history. On the outbreak of Madhism in 1884 it was being held by an Egyptian garrison of some 3,900 men, under the gallant Egyptian Commander, Ahmed Bey Rifaat. It then had a population of about 13,000. The fort was beseiged, and after a noble resistance fell, the garrison being treacherously massacred.

Using Kassala as their base, the Dervishes used to raid in all directions, more often in the direction of Khor Baraka and Agordat.

In December, 1893, the Dervishes attacked Agordat when Colonel Arimondi so distinguished himself. With a force of about 2,300 men, including artillery, he repelled an attack made by 8,000 Dervishes, under a noted Dervish warrior named Ahmed Ali. After a desperate fight the Dervishes were defeated and retired with the loss of between 3,000 and 4,000 men, including their chief.

In July, 1894, General Baratieri, who was then Governor of Eritrea, by some fine marching and able tactics surprised and recaptured Kassala Fort. He marched from a little west of Agordat Fort.

Kassala, by an arrangement with the Egyptian Government, was not permanently to be Italian property. It could be temporarily occupied by Italian troops should the military situation so demand.

1895 was a comparatively uneventful year.

In February, 1896, the situation of Kassala, after the Italian reverse at Adua at the hands of the Abyssinians, became critical for the following reasons:—

The Italians were severely defeated by the Abyssinians in February, 1896. The Dervishes, on hearing of this defeat and of the Abyssinian successes, immediately began rough seige operations against Kassala. Then, no sooner had they begun these seige operations, than the news reached them in March of an Anglo-Egyptian advance up the Nile from Wadi Halfa. This move relieved the situation, and all Dervish attention was thenceforth concentrated on the Nile, and their troops hastily withdrawn from the Eastern Soudan. In 1897 the Italian Government grew weary of holding Kassala, which was very expensive, and could never become an Italian possession, and they expressed their readiness to give it up. The Egyptian Government decided to take it over.

The attached map shows the disposition of the opposing forces in the year 1897, at the time the Italians gave up Kassala. The solid stars on the map represent the posts held by the Italian troops, and the open stars represent Dervish forces.

On Christmas Day, 1897, the fortress of Kassala was formally handed over to the Egyptians, and garrisoned by Egyptian troops, who came from Suakin *via* Massowa. On the 18th of December, a week before Christmas Day, 500 Arab soldiers, principally natives of the Kassala district and recruited from the warlike Hadendowa and Shukriyeh tribes, were voluntarily transferred from the Italian to the Egyptian service. On the 19th December they were inspected on an afternoon parade, and ordered to proceed at once that evening in two parties to attack the Dervish posts of Asobri and El Fasher, which were about forty miles distant from Kassala. They received their orders with marked feelings of satisfaction. These Dervish posts were approximately held by about 100 men in each, and had with their mounted men for some considerable period been harassing the fortress of Kassala, consisting of 2,000 men, by raiding in its vicinity, so much so that the Italian officers never left the precincts of the fort without being fully armed and escorted. In consequence of this, it was deemed advisable to attack these two posts and to do so before the Italians left on Christmas Day. They would be so to speak holding Kassala for us during the movement. It was hoped the operations would have been concluded by Christmas Day before the Italians had handed over. These hopes were realised. There was also another reason for quick action, viz., that the Dervishes, who naturally had good and accurate news of all our movements, would not expect us to carry on active offensive operations against them while we were in so many words "changing guard."

Capture of Asobri and El Fasher.

Our 500 levies were off in an hour after they had received their afternoon orders, half for El Fasher and half for Asobri. Both posts were successfully surprised on the morning of the 21st of December. The commander of El Fasher was among the killed, with about thirty of the garrison; the remainder fled to Gedarif. At Asobri the Dervishes retired into their loop-holed enclosure and resisted, losing fifty camels and 1,000 goats. At El Fasher there was no loot, consequently no inducement for the Dervishes to remain. Asobri was invested and the investing force, reinforced by the El Fasher contingent, numbering some 500 in all, formed a cordon. The investment lasted six days; on the evening of the sixth day a sortie was made, as all provisions and water had run out. Half of the Dervish force succeeded in breaking through the cordon and fleeing in the direction of Rera. Had we had guns, not a Dervish would have escaped—the post would have fallen. Application was made to the Italian authorities for the loan of two of their mountain guns on condition we paid for ammunition expended and found the *personnel* for working the guns. The request was readily complied with and the guns were half-way between Kassala and Asobri when the news came of the sortie.

Capture of Mugatta and Rera.

These same levies elated with their successes at Asobri and El Fasher, were then detailed to take the other two Dervish posts, Mugatta and Rera. On the 16th January, 1898, they occupied these two posts. At Mugatta the force of Dervishes retired without fighting. Rera feebly resisted in order to protect 1,300 sheep They eventually bolted and left their animals, which were brought into Kassala, together with ten prisoners.

Capture of Abu Delek.

With Asobri, El Fasher, Mugatta and Rera ours, there remained Gedarif and Abu Delek. Our losses in these little actions were trivial owing to the Dervishes being always surprised. They never seemed to be prepared for or expect attack. This unpreparedness may be possibly accounted for by the fact that the Italian troops had never worried them on the Atbara and west of that river. Abu Delek was captured on March 11th. Our levies surprised, captured and burnt the encampment, taking forty-seven camels. Twenty Dervishes were killed. Musa Digna, the brother of Osman Digna, was wounded. Our losses again were slight—we only lost three men, and that again was mainly due to the complete nature of the surprise. Our men got up to Abu Delek by 12 o'clock in the day and found the Dervishes asleep in their huts; the firing of our men in their village startled them and they ran away.

Surprise on the Atbara.

On the return journey the tables were turned, our men were attacked and surprised when about ten miles from the River Atbara. One would naturally ask who could have attacked them when the Dervish posts of Asobri, El Fasher, Rera, Mugatta and Abu Delek had been captured? The fact of the matter was, as it ultimately transpired, the attacking force consisted of a relieving force sent by the Khalifa to reinforce Rera.

This force arrived at Rera just in time to hear of the loss of Abu Delek, and at once determined on attacking our men by night not far from and west of the Atbara river. Our levies were surprised because their sentries were badly placed—they were too close to the main body, so close as to render it quite impossible to prevent the main body being rushed, and furthermore, when the sentries did report to the commander that they had seen cavalry in the distance, the commander, a gallant Sheikh of the Beni Amer tribe said, "No, no, impossible; there cannot be any cavalry; go back to your posts you must have seen some ostriches." It was very unfortunate this relieving force arriving at Rera when it did, had they not arrived at this inopportune moment, our forces would have returned to Kassala uninjured; as it was, severe hand-to-hand fighting took place, the losses on both sides being heavy, and we lost several men killed including our commander. Our wounded convoy of forty-seven returned to Kassala suffering mostly from sword and spear wounds.

Strategical Situation.

The result of these minor engagements in the Eastern Soudan was, that the Gedarif inhabitants petitioned the Khalifa for assistance, themselves fearing attack. The Khalifa consequently withdrew his cousin Ahmed Fedil with 5,000 men from the Nile force, (commanded by the Emir Mahmud,) and sent him to Gedarif. It was satisfactory to all of us to feel, that with our small force we had been able to render some slight aid to the Anglo-Egyptian force by being instrumental in lessening the forces opposed to them.

Occupation of Adarama.

To turn to the Atbara for a moment. Adarama was in the month of March garrisoned by raw levies raised at Kassala and enlisted from the Hadendowa tribe who opposed British troops with such bravery at El Teb and Tamai in 1884. Adarama was Osman Digna's stronghold for some years. From there he retired without any fighting on General Hunter occupying Berber, in the autumn of 1897. As soon as Osman Digna went, we sent up levies from Kassala, and garrisoned Adarama.

Mahmud's defeat on the Atbara.

After this occupation, the next important incident in the Soudan was the news of the Emir Mahmud's defeat on the Atbara in April 1898, gratifying news to us, as we had heard a report that for some few days early in April, Mahmud and his force could not be found. We concluded he was coming up the Atbara to invest Kassala, particularly so when we heard that Osman Digna had moved from the Nile and attacked our post at Adarama. It appeared probable he was commanding Mahmud's advance guard and heading south.

Interception of fugitives on the Atbara.

Our orders after the defeat of Mahmud were to intercept all fugitives heading for Gedarif and Abu Delek. Major Benson was now appointed Commander of the levies who, throughout the previous actions had been fighting by themselves under their own sheikhs.

He had under him, manœuvring on the river in April 1898, about 400 men, his second in command, at a later period being Major Wilkinson, of the Lincoln Regiment, and was ably supported by Sergeant Nicklin, North Staffordshire Regiment. This N.C. officer distinguished himself greatly throughout the Gedarif operations and has been brought specially to notice.* The plan of operation was to hold the river between El Fasher and Asobri by establishing small posts at intervals between these two places and connecting them by camel patrols, with a main body in hand to deal with the formed bodies of Dervishes. By holding these two places and establishing communication between them we could hinder the fugitives for a distance of fully thirty miles from obtaining water from the river. Some of the mounted Dervishes succeeded in getting round, but of the footmen very few managed to do so, 600 of them were taken prisoners and some 350 killed; quantities of loot, principally horses, were captured. The results, which speak for themselves, were eminently satisfactory, the Arab soldiers were specially pleased at having this fine opportunityof paying off old scores and getting such valuable prizes. Three hundred of these prisoners, all of them Soudanese, were afterwards enlisted in our black Battalions and fought on our side against the Khalifa at the fall of Omdurman. Osman Digna himself made a *détour* by night and was reported to have halted north of El Fasher; he started from just north of Asobri. He was surprised and nearly captured at mid-day on the 19th April. Reference will be made to that later. Stragglers kept passing up the Atbara for some weeks, a party succeeded in May in severely wounding Lt.-Colonel Lawson, who had succeeded Major Benson in the command of the Arab levies on his giving up his command.

Operations against Gedarif commence.

Nothing of importance occurred during the months of last July and August, but on the evening of the 5th September, news of the fall of Omdurman reached Kassala from Italian sources and on the morning of the 7th the garrison marched out with the object of occupying Gedarif. The force that marched out consisted of 450 men of the 16th Egyptian Battalion, under Captain McKerrell of the Cameron Highlanders, who had Captain Dwyer of the Surrey Regiment as his second in command, 450 of the 500 Arabs taken over from the Italians, under the command of Major Wilkinson of the Lincolnshire Regiment, and 370 Arab regulars under Lt.-Colonel Lawson, R.E. We had also with us eighty blacks who had been discharged from the Soudanese Battalions for old age and medical unfitness under Captain the Hon. Hore Ruthven. These blacks belonged to the Egyptian Slavery Department, were mounted on camels, and did the reconnoitring on the march. We had no cavalry, no guns, and no Maxims.

The military situation on the 7th September was as follows:—The Dervish Emir, Ahmed Fedil, a cousin of the Khalifa and governor of the Gedarif Province, was with 5,000 men at Abu Haraz *en route* to Omdurman to help the Khalifa in the defence of Omdurman, he was too late to get there and was halting on the Blue Nile. He was practically stopped by our gun boats. He explained the presence of these gun boats to his men by saying that they had run the gauntlet of the Omdurman Forts but that the other boats had been sunk. Fedil's Lieutenant, the Emir Saadalla, was in command at Gedarif, and he had under him 1,700 Riflemen, 1,600 Spearmen and about 300 Baggara Horsemen as his force. It was of every importance for us to get to Gedarif as quickly as possible, because should Fedil hear of our advance and return to Gedarif with his 5,000 men and arrive there before we did, it would have been naturally impossible for us to attempt to seize Gedarif with our 1,400 rifles; as it was we had all we could do to successfully encounter Saadalla.

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* Since commissioned.

Passage of the Atbara.

We arrived at El Fasher on the 9th September; for the forty miles between this place and Kassala, there was no water. Owing to having no means of crossing the River Atbara, which when we got there was running at the rate of four miles an hour and was about three hundred yards wide, we had to construct boats. The frame-work of these boats was made of Mimosa bush collected on the banks, and these frames were covered with tarpaulins. With the aid of some six of these so-called boats, supplemented by rafts, the passage was completed in six days, the losses in the passage were one camel drowned and some boxes of Martini-Henry ammunition lost. Camels were swum across with inflated water-skins tied under their jowls.

Mugatta reached.

At midday, the 18th September, Mugatta was reached; we did not yet know whether we were going to be attacked or not on our entry into Gedarif. Possibly after the news of the fall of Omdurman had reached Gedarif the Dervishes would not hold out, their force might melt away; no Dervish patrols had come near us; up to date we had seen nothing of them. This carelessness on the part of the Dervishes as regards patrolling may be attributed to the fact that they thought that the river was at the time an impassable obstacle to a large force and further they were deceived by a small post we had formed at Hasabulua. It was originally intended to cross there but the existence of a poisonous wasp-like fly which attacked animals, camels principally, prevented our doing so. The Gedarif Emir had made up his mind the passage would be made at Hasabulua in the event of an attacking force from Kassala marching on Gedarif and had issued orders that his patrols need not, as a rule, proceed further north than Hasabulua.

Egyptian outposts attacked.

On the afternoon of the 18th our outposts, which were purposely placed some one and a half miles west of our encampment with the object of preventing our force being reconnoitred, were attacked. There was now no doubt but what we should meet with opposition, forty Dervishes had come up from Gedarif accompanied by a few horsemen, discovered our movements and had hastily retired to report. There were a few casualties on either side; the Dervishes lost their commander who was killed and seven prisoners.

Further advance, Wad Akabu.

We decided at once to push on. On the morning of the 21st September the eighty blacks under Ruthven, who were well in front of our forces, came across some Dervish horsemen and drove them in; we were then about twenty miles from Gedarif and west of Tomat. Meeting with no further opposition we bivouacked that night ten miles from Gedarif and south of Wad Akabu, which is a long saddle back running east and west. All the country round Wad Akabu is flat, the Dervishes had established a look-out post here to watch the Mugatta—Kassala roads. This post retired before us; we found it unoccupied on the afternoon of the 21st and bivouacked three and a half miles south of it. I would mention that the march between Mugatta and Wad Akabu was exceedingly difficult owing to the intense heat and lack of water; most of the marching had to be done in single file through thick bush. The wells at Wad Akabu had been filled in; there was some muddy rain-water collected in empty grain pits, and we were able to fill up our water skins from these pits. At midnight on 21st a deserter came in from the Dervishes to say that the Dervish force of 3,500 men had marched out of Gedarif and were in their "dem" or bivouac waiting for us in a valley two miles north of Gedarif.

Composition of the Egyptian Force.

It was an anxious time; we were 7 British officers in all with 1,400 to 1,500 troops made up of Egyptians, Soudanese, Hadendowas, Shukriyeh and other tribes. How this combination would work together we had as yet no experience; the only thing to do was to keep together and close up as much as possible. The gallantry of the Arabs was undoubted having been repeatedly tested; but whether three British officers could control and keep in hand more than 800 of them in the heat of a hotly contested engagement had yet to be proved. The three officers in charge of these Arabs were Colonel Lawson, R.E. Major Wilkinson of the Lincolnshire Regiment and Lieutenant Morant of the Durham Light Infantry.

Battle of Gedarif.

Marching just before daylight on the 22nd September from our bivouac, at about 7 o'clock in the morning, Ruthven and I could see the Dervish forces in their "dem" in an irregular column formation flying their banners and beating their drums. They appeared to be more numerous than we had been led to believe from reports received from the Nile and other sources. Our main body came up to the hill from which the Dervish position was observed at about 7.30 in the morning. Collision, judging by the distance the opposing forces were apart, must take place in about half an hour. We thought we could seize the saddle back on which the action took place before colliding; it was no good fighting in the valley which was rocky and overgrown with long grass six feet high. It was a country we knew nothing about and the Dervishes understood thoroughly. We doubled across. The Dervishes were then advancing. The question was, could we get across before the Dervishes launched their attack. We just managed it. As soon as we reached our position the Dervishes deployed to their left.

One of their three regiments was sent a detour round with orders to attack the rear of our column, containing our impedimenta, ammunition, etc. We felt that if we could repulse the attack we could get on the road to Gedarif and cut in between the Dervishes and their base. About half past eight the opposing forces had met. We were on our hill in column formation. The Dervishes stormed up the eastern slopes of the saddle back. We came into line to our left. Owing to having only one Egyptian officer on the staff, and there being no British officers available (no other Egyptian officer could be spared) most important messages and orders had on the field of battle to be sent verbally in Arabic by Arab Sheikhs to the British officers. For instance, notice of this turning movement on the part of the Dervishes to attack our baggage camels was sent to Captain Fleming of the R.A.M. Corps by an Arab Sheikh. It was the lack of officers that added so greatly to our difficulties throughout. He fortunately understood and had time to close up and successfully repulsed what eventually proved to be a most determined attack on the rear of our column. The Dervishes attacked with such fierceness as to approach within thirty yards of our baggage camels, losing 150 killed and wounded in the onslaught. We lost in that portion of the field forty Egyptian soldiers and fifty-eight camels; it was on this occasion that Ruthven gained his Victoria Cross (applause). He had been told about this turning movement and was watching that part of the battlefield. The Dervishes drove him back on the 16th battalion under McKerrell, and while retiring, one of his officers was lying on the ground badly wounded. During this retreat Ruthven alternately fired and carried this wounded Egyptian officer back to the 16th battalion (loud applause).

Gallant conduct of Egyptian troops.

The 16th Egyptian battalion behaved with great steadiness under exceptionally trying circumstances and by their soldier-like conduct saved the day; had our ammunition column been destroyed the day would have been lost. Simultaneously with this desperate onslaught on the baggage the Arabs were advancing and driving the Dervishes off the eastern slopes of the saddle back, eventually completely routing them. As soon as the Arabs had driven these two regiments of Dervishes back, they were directed to seize the hill south-east of the scene of the fighting. This feature is really much larger than the map represents it to be. It completely commanded the Gedarif road and was the key of the position.

Pursuit by Arab troops.

It was 10 a.m. when the Dervishes had failed in their attacks and were being pursued by Colonel Lawson, R.E., and his Arabs in an easterly direction and by Major Wilkinson's Arabs in a westerly direction. Had we had mounted troops at our disposal we could have cut them all to pieces. Communication was at once established with Gedarif, where we ascertained that the Emir Nur Angora was waiting to surrender with 200 armed black soldiers and two brass guns. These brass guns were subsequently used by us on the 28th September, but with little effect as the fuzes would not act.

Surrender of Nur Angora.

On entering Gedarif at mid-day, this Emir Nur Angora handed to me a little piece of paper, which was a slip written in Arabic, sent by Slatin from Omdurman, telling him briefly the game was up and that he had better surrender. This paper was concealed in the handle of a spear, carried from Omdurman to Gedarif in that way. It was 1½ inches square in size. A noted man was this Emir, very black, a native of Dongola, and between fifty and sixty years of age. He formerly served under Slatin, also under Gordon, and under Zebehr Pasha in Darfur, about 300 miles west of El Obeid; he had been wounded thirteen times and had seventy wives, (sixty-five of whom were at Gedarif), and 110 children. He informed us that his sons were all scattered over the Soudan, and those who were old enough to carry arms were doing so by his orders. He held an important command at the action of Agordat against the Italians, and was wounded there. He had been fighting all his life. I asked him, "Were you at Abu Klea?" "Yes," he said, "but I was not fighting." "What were you doing?" "I went to bury the dead," he said, "by order of the Khalifa." This was not a truthful statement, as he held an important command against us throughout. This Emir proved to be of very great value; he thoroughly knew the country, and knew all the inhabitants, and was the channel through whom we communicated with the Arabs and Abyssinian Emperor Menelik, to whom letters were sent announcing our arrival at Gedarif. Colonel Wingate, in his book on "Mahdism," says that "this Emir was thought highly of by Gordon, "was known to be a man of courage and ability, and had taken a very "eminent part in Soudan affairs and it would be interesting to watch "his career." He was mainly instrumental (among many services rendered) in bringing in to us deserters from Fedil's force.

Egyptian losses.

Totalling up our losses on the 22nd September, we found we had lost altogether between fifty and sixty killed and eighty wounded, and the Dervishes 500 killed. These numbers were not guessed at, but reported as being correct by Dervish deserters who were present at the fight, and who subsequently surrendered.

Ammunition runs short—a dash to Mugatta for the reserve supply.

We had fired an enormous quantity of ammunition, of which therewere unfortunately three kinds, viz., Martini, Remington and Vitelli. Our reserve ammunition was at Mugatta, where a post had been formed before making the forced march on to Gedarif. It was important to get up this ammunition as quickly as possible. On the 24th September, two days after we got into Gedarif, I decided on going to Kassala to get to the end of the wire and hurry up the ammunition from Mugatta as I passed. When six hours out of Gedarif at Wad Akabu, I received a note from McKerrell, who was in temporary command at Gedarif, to say Nur Angora thinks Fedil, who is at Abu Haraz, will try and re-take Gedarif. The question then was, could we get to Mugatta and back with the ammunition before Fedil could come from Abu Haraz to Gedarif with his infantry. It was calculated from some very excellent maps furnished by our Intelligence Department at home, that the distance to Kassala from Gedarif *via* El Fasher was approximately the same as from Gedarif to Abu Haraz. I calculated on being able to get from Wad Akabu to Mugatta and back to Gedarif before Fedil could get to Gedarif from Abu Haraz. Fedil would not get the news of the fall of Gedarif before the 24th. We started from Wad Akabu much about the same time as Fedil would start from Abu Haraz. Riding hard, it was possible to do it. The Arab camel drivers at Mugatta had heard of the fighting at Gedarif, on the 22nd September, and were alarmed; it was feared they might desert. By alternately threatening them and offering baksheesh, the ammunition caravan and self arrived from Mugatta at Gedarif at 2 p.m. on the 27th September.

Attack on Gedarif by Ahmed Fedil repulsed.

At 7 a.m., on the 28th September, Ruthven, who was out with his blacks reconnoitring, sent in word to say that he had seen forty Dervish horsemen about three miles off on the Abu Haraz road. He reported them as heading east, and also mentioned he had heard tomtomming. I sent for Nur Angora and asked him "What does this mean?" and he said, "Well, there is no doubt about it, it is the advance-guard of Fedil." We immediately stood to our rifles, taking post in three loopholed brickwall enclosures. The long durra stalks, some 10 feet high, had been cut down for a distance of 300 yards from these enclosures between the 22nd and 27th September. These enclosures were in echelon, formerly the private establishments of Dervish Emirs, and situated on commanding ground, lending themselves admirably for defence; they happened to be the right size and required little doing to them. At 8 o'clock on the morning of the 28th September we were being attacked from the north, south and west. The attack lasted for one hour and then failed, none of the Dervishes being able to cross the open belt of 300 yards. It was a badly conceived attack on the part of the enemy. They had never reconnoitred our position and had imagined under cover of long grass they could approach to our walls, being totally unaware of the space that had been cleared. The first attack having failed, at 10 in the morning another attack was launched by their second line, this also failed. At 12 o'clock our Arab troops sallied forth and cleared off the few Dervishes that remained.

Ahmed Fedil harasses Gedarif from the vicinity.

Fedil retired then to a clump of palm trees two miles west of our position, taking his force with him and remained there for two days till the 1st October; during those two days he harassed us incessantly, firing into the place at night and threatening us on all sides by day. On 1st October he retired to Gebal Assar, eight miles south on the road from Gedarif to Karkou and continued the same harassing tactics, succeeding on one occasion in capturing a small convoy of eight camels, bringing specie from Kassala. With such an extended line of communication and with such a very small force, the only way of keeping up communication at all was by leaving and entering the town by night.

Egyptian reinforcements from Omdurman.

The situation was far from satisfactory and assistance was asked for, resulting in a force of about 1,200 Soudanese, and some camel corps joining us after hard marching from Abu Haraz. The force that thus reinforced us came by boat from Omdurman to Abu Haraz and then across country to Gedarif, Lt.-Colonel Collinson, Northampton Regiment, being in command. The march was a very severe one, and rendered difficult on account of scarcity of water between Abu Haraz and Gedarif. General Rundle organized and equipped this force with great difficulty owing to scarcity of camel transport. He had heard of the awkward situation in which we found ourselves, and being at the time G.O.C. the Soudan, did everything he possibly could to help us. We were all sorry his duties on the Blue Nile prevented him leaving the river and coming himself with the force he sent over under Lt.-Colonel Collinson. The reinforcements arrived on the 21st October, and on the 22nd the Dervishes made a feeble attack after dark ; we lost two wounded on our side.

Ahmed Fedil refuses terms and retreats.

On the 23rd October a strong reconnaissance was made in the direction of Gebal Assar, when Fedil was seen moving in a southerly direction, having left a strong rear-guard with the double object of covering his retreat and preventing deserters coming to us. Nur Angora all this time had been working with success on our behalf. He had informed the Dervishes of the fall of Omdurman and flight of the Khalifa, facts of which they were apparently ignorant until after the fighting on the 28th September. This may be accounted for partly by the fact that the news of the fall of Omdurman was sent to Fedil by one of the Khalifa's jail officials, who had been taken prisoner at Omdurman. This man who brought this news of the fall of Omdurman was killed by Fedil, in order to prevent the news spreading. In the same way, on being informed from sundry sources that Fedil was inclined to surrender, we sent terms of surrender to him by a messenger, who was one of Fedil's own tribe. We thought he would spare one of his own clan, but he did not, he killed him. Fedil responded to my letter by attacking us. Through lack of sufficient transport, the numerical inferiority and fever stricken state of the Gedarif garrison, it was impossible to organize a sufficiently strong force to hold Gedarif, and at the same time carry on an effective pursuit, in what was practically a waterless desert in the country between Gedarif and Karkou. In numbers we were one to their five; as regards fever, one morning sick report shewed 270 Egyptian soldiers down out of a strength of 450.

Surrender of Soudanese who turn against Fedil.

Many Soudanese came over after the retreat from Gebal Assar commenced, they began to realize it was no use going on, and felt they had had enough fighting. 500 Soudanese in a body under their Emir, a Darfur chieftain, named Abu Bakr, surrendered on the 24th October. The Emir and these 500 men were asked on parade why they attacked us on the 28th September, ramming their heads against our brick walls and losing 500 men in the attack, our losses being five, a remarkable instance of the value of field fortifications against savage troops without artillery. We went on to explain to these Dervishes that Omdurman was taken, and that the Khalifa had gone away, and furthermore in picking up their banners after the fights on the 22nd and 28th September, we read extracts inscribed on their Koran, saying the Khalifa was the Prophet of God, etc., whereas there was no Khalifa, he had run away. To these remarks they replied angrily to the effect that when they attacked on the 28th September, they knew nothing about all this, as Fedil had never told them of the fall of Omdurman and subsequent flight of the Khalifa. They appeared very irritated, and taking advantage of their animosity against Fedil, I asked them if they would like to follow him up, and harass him on the march and loot him of his cattle and impedimenta, I agreed, if they assented to pursue, to give them back their rifles and good Egyptian ammunition, instead of their bad Omdurman cartridges, stipulating they must leave their families behind for us to take care of and safeguard; we wanted them as hostages. To these conditions they readily consented and were off in twenty-four hours on the track of Fedil, on whose side they had been fighting a few days, you might almost say a few hours before. I heard of these same men a few days afterwards; they sent me in the heads of two of Fedil's sub-lieutenants packed in a box. It afterwards transpired that they had been fighting and lost thirty men. The most recent news of them was that they had joined Lewis's column, and were fighting again with him at that successful fight that took place about last Christmas day at Rosaires. Unfortunately Fedil after this, his third decisive defeat, again escaped with a few followers, and is no doubt now with the Khalifa in the vicinity of lake Sherkelah, reconnoitered by Colonel Kitchener not long ago.

Summary of the Gedarif operations.

Summing up the fights on the 22nd and 28th September, the Kassala force was favoured by fortune; first, we were not discovered in this offensive movement till we had reached Mugatta. Secondly, the Dervishes came out to fight us in the open instead of remaining in their walled enclosures, out of which position we could never have turned them, having no guns. Thirdly, the arrival of the reserve ammunition from Mugatta, a few hours before the attack by Fedil on the 28th September came off. According to the rules of warfare, the Kassala force ought not to have won, and so little did the non-fighting element of Kassala think of our chances of winning, that they on our departure migrated in numbers to the Italian colony for safety. This little expedition to Gedarif was noteworthy from a financial point of view, in that it cost nothing, that is to say, we lived in the place gratuitously long enough to pay for our travelling expenses and war losses. The losses in action were heavy, but not more than could be expected when we consider the disparity of the forces engaged, and that for two hours on the 22nd September, it was a fair stand-up fight in the open, rifle against rifle.

Nur Angora on the Khalifa To refer to Nur Angora for a moment, we had many conversations with him on the Soudan in general, Darfur, etc. We asked him what did the Khalifa do when he heard of the news of the advance of the Anglo-Egyptian force, of the fall of Dongola, Berber,etc., and Nur Angora replied :—

"I was at Omdurman when the news of your advance came. The Khalifa on learning of it was very much concerned, and shut himself up in his private apartments for six days and would see nobody. After the taking of Berber and subsequent operations at Kassala, he collected his Ulema or learned men, and addressed them as follows:—‘What does all this mean, at one time I was marching on Cairo (referring no doubt to the Toski campaign) and my influence extended as far as the Red Sea. Now day by day I lose post by post,’ the Ulema replied : ‘it is the will of God, and you must submit, Mahmud will recover you your lost territory.’ After the defeat of Mahmud, the chief of the Ulema was decapitated for not having spoken the truth".

Osman Digna. With reference to Osman Digna, Nur Angora reported he was at Gedarif when Osman arrived there after his escape from the Atbara. He arrived footsore with scanty apparel, on a horse without a saddle, on which he escaped on being surprised by Major Benson's patrol. When asked to explain what had happened Osman said with reference to the battle at Atbara that he had fought the infidels many times, but he had never had such a doing as he had had at this battle of Atbara. First, he said countless guns came into action, and under cover of their smoke the infantry advanced, then you heard a lot of music, and the infantry were on the top of the Zareba with their spears, he went on to say that he had advocated different tactics from what the EmirMahmud pursued. Osman wished to keep a containing force on the Nile near Shabluka cataract, and raid and harass with all the mounted men in the direction of Dongola, Berber and Kassala, he advocated having one big decisive fight outside Omdurman, and not fighting on the Atbara at all. The Sheikhs round Kassala told us that those tactics would be probably pursued by Mahmud and Osman. Osman was asked by Nur Angora to describe what happened when he was surprised north of El Fasher. He said he was asleep under some palm trees at midday having travelled all through the night from considerably north of Asobri when he heard the firing, and jumped up, seized the nearest horse and was off, adding that had the firing not commenced so far off as it did, the chances were that he would have been captured, as it was he had time to escape, but in the hurry of departure he had left behind him all the dollars he owned in the world. He concluded by saying his friend the Jaalin Emir Sheikh Ed Damer, was captured, and confided in Nur Angora in so many words that the game was now up, and that they had no chance of ultimate success. It was unfortunate Osman was not caught, for had he been captured there might have been no influential Emir by the side of the Khalifa urging him and assisting him to escape from Omdurman at the time he did.

Nur Angora's Cruelty.

In bloodthirstiness and cruelty it is hard to say which of the principal Dervish Emirs excelled. Instances of Ahmed Fedil's cruelties have been already given; we have also all heard of the Khalifa's and Osman Digna's cruelties. Nur Angora who was with us, and our ally, was in reality just as cruel. In addition to his duties as chief of the Intelligence Department, he was given charge of all the prisoners captured on entering Gedarif, and also of all deserters from the enemy. One evening at sunset he as usual reported to me the incidents of the day, and concluded by asking permission to shoot eight Baggara prisoners, on the plea that he was afraid they were conspiring to escape. Permission was of course refused, and he was directed to separate these eight Baggara and place them in chains. The next morning at sunrise he came to me and said "Oh! I have killed those eight Baggara," and in reply to a question as to why he had done so and thus disobeyed orders, he said they had tried to escape in the night. His attention was drawn to the fact that there were no shots fired in the night, whereupon he said "yes, I know there were no shots fired, my sword bearer cut their heads off." On going to see if his report was accurate (for it was possible they had escaped, and he did not wish to admit it) I found it was only too true—he had decapitated the eight Baggara.

Other anecdotes.

Slatin refers to Nur Angora in his book. He says when fighting in Darfur against a man called Sultan Harun, Nur Angora was victorious, the Sultan was killed, and his head sent to El Fasher, in Darfur, as a proof of the victory. Another interesting anecdote with reference to General Gordon and Angora is described by Slatin as follows: "Nur Angora had an old mother about sixty years of age living at Dongola, and in spite of his wild character, she had the same affection and care for her son that Rauf Pasha's mother had for him. It is said that when Gordon was in Dongola, an old woman asked to see him, and on entering said, I am Nur Angora's mother and have come to seek your help, but said Gordon, you have a good-for-nothing son who passes his time in riotous living, instead of looking after his old mother. Ah said the old woman, may he be always happy I forgive him, but I want you to help me, Gordon presented her with £50 from his own pocket, and she returned home heaping blessings on his head and on that of her undutiful son." (Applause.)

Character of Arabs

By nature excitable and fanatical, very loyal to their chiefs, conservative in their ideas, decidedly warlike, easily influenced and led; we won their gratitude to a marked extent by helping them to rebuild their great mosque at Kassala that had been destroyed by Osman Digna. Prison labour and slight aid from local funds was all the help that was given them; we were amply repaid by the feelings of gratitude and kindly feeling the Arabs showed to us in return for our personal interest in their religious institutions.

Appearance and constitution.

Small and light build, wiry and hard in appearance and capable of making long and rapid marches on little food and water, and consequently of great fighting value in a country like the Soudan. They are bad shots; it is difficult to instil into them fire discipline; no amount of training would ever do that.

An area of bloodshed.

I will for one moment draw your attention to the map, one cannot help being struck by the number of places that have been the scenes of blood-shed and contest within the last twenty-five years, viz., Dongola, Abu Hamed, Sinkat, Suakin and Tokar, and Saati not marked but twenty miles west of Massowah, where Italians and Abyssinians met in 1889, also Adua, Magdala, and then Gallabat, where the Dervishes fought the Abyssinians, Gedarif, Kassala, Metemma on the Nile, Abu Klea and north-east of El Obeid, the scene of Hicks Pasha's defeat. There is hardly a place you can point out on this map that has not been the scene of recent fighting.

Italian courtesy.

In conclusion, I wish to place on record the very cordial relations which have been always exsisting between us and the Italian officers. They did everything they could possibly do to help us, and always treated us with the very greatest hospitality and courtesy, anything they had in their stores that we required they gave us, including rifles and plentiful supplies of ammunition, the lending of the two mountain guns to which I have already referred was a very kindly act, I shall always feel that we owe them a great deal. (Loud and prolonged applause.)

DISCUSSION.

The CHAIRMAN invited discussion on the lecture, and specially requested three officers who had been in the Soudan, Colonel Williams, Count Gleichen and Major Benson to join in it.

Lieut.-Colonel W. H. WILLIAMS, R.A.: General Maurice, ladies and gentlemen, I think it a great honour to be allowed to say a few words after the charming lecture that my friend Colonel Parsons has given us this afternoon. His thrilling account of what has happened in that region has been most enchanting, and having passed some years in Egypt, and also at the other extremity of the Soudan, I have followed all and everything that has happened in Egypt with the greatest interest. The lecturer speaks of the slaughter of the blacks at the capture of Kassala. I took a number of Sudanese who had been part of the old Egyptian garrison with me to Uganda in 1890, and the tales they used to tell me of the old garrisons then were even more thrilling than what we have heard this afternoon. We talk a great deal about what some of our garrisons have done, and very rightly so; but I think the British public little knows what some of these black men have done and how they have stood under every sort of provocation. Some of the tales of these old garrisons, if ever written, will be most interesting, and they reflect the greatest credit on these poor black men who, in spite of every sort of neglect, have remained faithful to their ruler, H.H. The Khedive (applause). I do not wish to talk about the 32nd and 37th Field Batteries of which I feel sure you have heard more than enough, but I should however like to say a word or two about the Egyptian Artillery. I spent some time in Egypt when Colonel Parsons commanded them ; and I had the honour of being brigaded with them under Colonel Long, at the battle of Khartoum. I think that we as artillerymen should be extremely proud of our connection with that most excellent corps. I have seen them in action and on the march, and nothing could be better. Those who talked of the shooting of my battery seemed to forget that the real brunt of the battle from an Artillery point of view was borne by three batteries of the Egyptian Artillery, we were comparative spectators at that time, but they were in the thick of it, and I am told that their shooting was most accurate and steady and materially contributed to the defeat of the Dervishes. And I would mention in this connection the names of the Commanding Officers, viz. Young, Lawrie, Peake and deRougement. Then we all of us know about Major Young's horse battery, (applause) some of us may criticise, but I do not know whether we all know that his guns were practically useless—certainly two of them were, but in spite of this handicap, Major Young I consider brought great glory on himself and on the Regiment, (hear hear). He did extremely well, and I feel it to be a great honour that I have the opportunity of saying from the point of view of one of the Royal Artillery present at Omdurman, how very much we all thought of his, and all the batteries the Egyptian Army. (applause). Colonel Parsons has told us all about the horrors and the fights which have happened in these last twenty years, but I hope the next lecture which may be given in this Theatre on the Soudan, will be on the progress and the advancement of the people of that country, whose destiny is in the hands of a gunner and a sapper, that is to say of Lord Cromer and Lord Kitchener (applause).

Major A. E. W. Count Gleichen, C.M.G., Grenadier Guards : General Maurice, ladies and gentlemen, I think in Colonel Parsons' very interesting lecture he has covered all the ground of the Eastern Soudan, and the recent fighting there. The only thing he has suppressed is his own part in it. Throughout the lecture he always spoke of the operations in the third person, and never referred to himself (applause). There is not very much for me to say, but there are two points only, which struck me as being useful to mention and which I might touch on. The one is the composition and organization of this Arab battalion. We have heard little of this organization, and we have not had much detail of how it was composed, or the tribes from which it was recruited, and I should like to ask Colonel Parsons to tell us something about that ? The other point is the question of the future development of the Eastern Soudan. You will have seen in the newspapers lately I daresay, that it is the intention at some future date, I hope not very far on, to continue the railway from Omdurman up to Abu Haraz and across to Gedarif, and up by Mugatta and Kassala, and right away down to Suakin again. Now I should like rather to hear Colonel Parsons' views on the possibility of that railway and the extent to which it would develop the country ? (applause).

Major G. E. Benson, R.A. : General Maurice, ladies and gentlemen, I have not very much to say, I told my story in the January number of the 'Proceedings' of this Institution,* but I should just like to add my testimony to that of Colonel Parsons on the kindness of the Italian officers. I was in their country, Eritrea, for some time, and they were very kind to me in every possible way. I have had many talks with them on the subject of Kassala, and they told me that they were prevented from doing anything there by orders from Italy. They were not allowed to do anything in the way of attacking the Dervish posts at El Fasher and Asobri. As regards my share I may say I was very much handicapped by having no cavalry, and only had a sort of makeshift mounted infantry, two men on a camel, or a total of about sixty men on thirty camels; also twenty-five miles of river in that rough country was far too much for 400 men to watch, and as a matter of fact some thousands of Dervishes got past me. I had less than 400 men on an average throughout, as I had to detach men from time to time as escorts for prisoners sent to Kassala. I cordially agree with what the last speaker has said, regarding the way Colonel Parsons has omitted all reference to himself in his lecture. No one knows better than I do the numerous difficulties he had to contend with; lack of British officers, lack of men, lack of transport, difficulties with natives over money transactions, besides endless other worrying matters. I think also that I am right in stating that it was left a good deal to Colonel Parsons' discretion whether he should advance on Gedarif. If this is the case it is to the credit of Colonel Parsons that he hardened his heart to undertake the responsibility of what was decidedly a risky expedition. (Applause).

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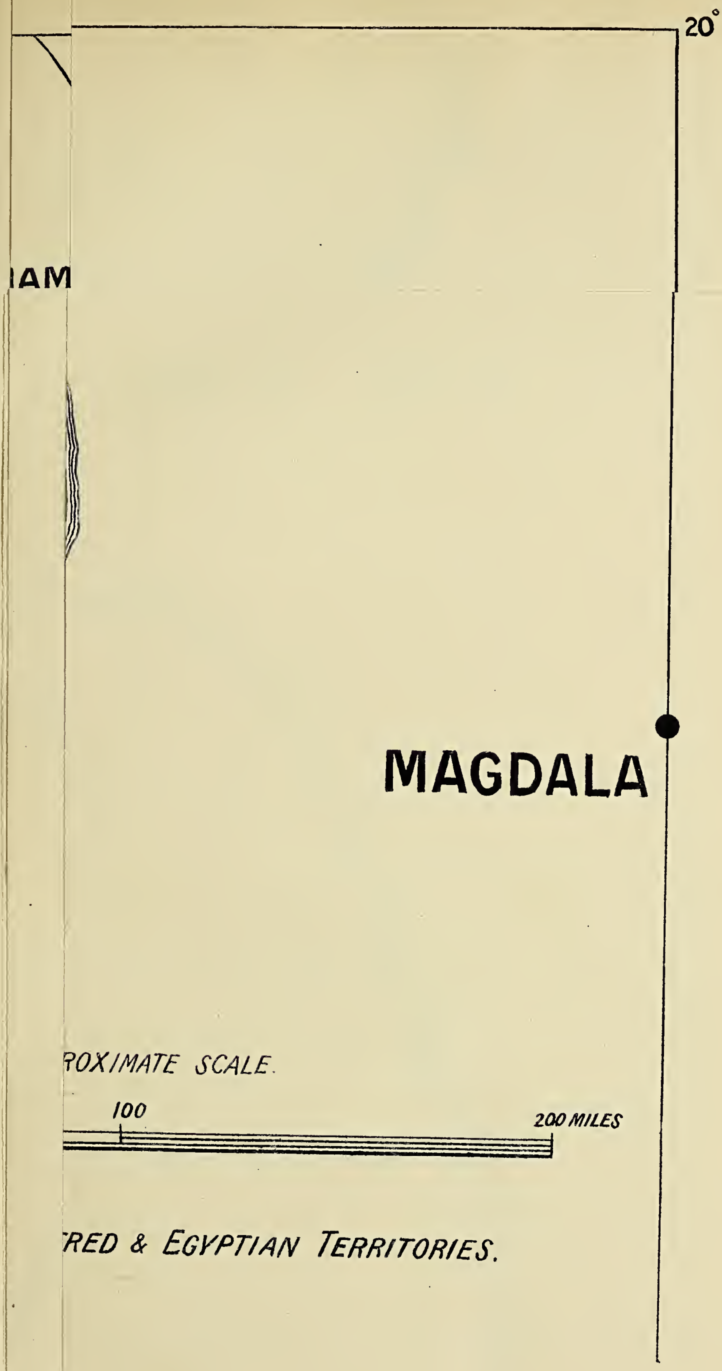
* R.A.I. 'Proceedings,' Vol. XXVI., No. 1, "A Patrol on the Atbara."

REPLY.

Colonel Parsons: With reference to Count Gleichen's enquiry about the composition of the Arab battalion, I have details, but not here; speaking generally, it consisted of about 500 men of four companies and they were commanded by two British officers who had under them four Egyptian officers. Each company, of 125 rank and file, was commanded by an Egyptian officer, and was armed with the Vitelli magazine rifle. As regards the future of the Eastern Soudan I should not like to predict what will take place; the present organization allows for a British officer at Suakin, who is in charge of the sub-district there, and there is a British officer for Kassala and a British officer for Gedarif; formerly there was an officer commanding the Eastern Soudan but he has been done away with. I ought to have stated in my lecture that the dotted lines on the map are intended to represent Egyptian telegraphs, as the line was laid before Mahdism broke out. The perfection of that system is remarkable. There was a telegraph line as far as Metemma on the borders of Abyssinia and a line running to El Obeid. With regard to the future railway system in the Eastern Soudan, the line that suggests itself is the line up the Atbara from Berber to Adarama, and from Adarama to Suakin and Kassala. Between Adarama and Suakin there are no engineering difficulties till north-east of Sinkat, when there is rather a big drop of about 3,000 feet into the Suakin plain. The alternative route from Suakin to Berber is undoubtedly throughout its entire length a difficult line to construct. The line to Kassala from Adarama is easy, running along the banks of the Atbara to Goz Rejeb, and thence branching to Kassala following the old telegraph line. The main line could be continued from Goz Rejeb to Mugatta and Gedarif along a level plain. By connecting Kassala and Suakin *via* Adarama, a great difficulty in connection with the Khor Baraka is avoided, as owing to the number of transverse khors running from east and west into it, the amount of expensive bridging required in connection with a railway running north and south along the Khor Baraka would be considerable. I think the Eastern Soudan Railway would pay eventually when trade is developed. Gedarif is the granary of the Eastern Soudan, it could provide grain for local requirements and still have a large surplus for exportation. Excepting in durra, gum, ivory, and feathers there is little trade. Sheep and cattle are of a poor description and in no great quantities. Cotton stuffs and Manchester goods were being imported by the Greeks and sold at large profits to the natives in December last. There are no minerals that I have heard of, not even about Suakin; the only district where minerals are likely to be found is in the Beni Shungel country, far south of Gedarif on the Abyssinian frontiers (applause).

General Maurice: I think, ladies and gentlemen, I have nothing to say myself except that I have been anticipated in the one remark I had to make, namely that Colonel Parsons has very much diminished the interest of the lecture for us by the great modesty with which he has excluded the personal element throughout (great applause); therefore I think I can only conclude by offering your very hearty thanks to Colonel Parsons for the very interesting lecture he has given us (cheers).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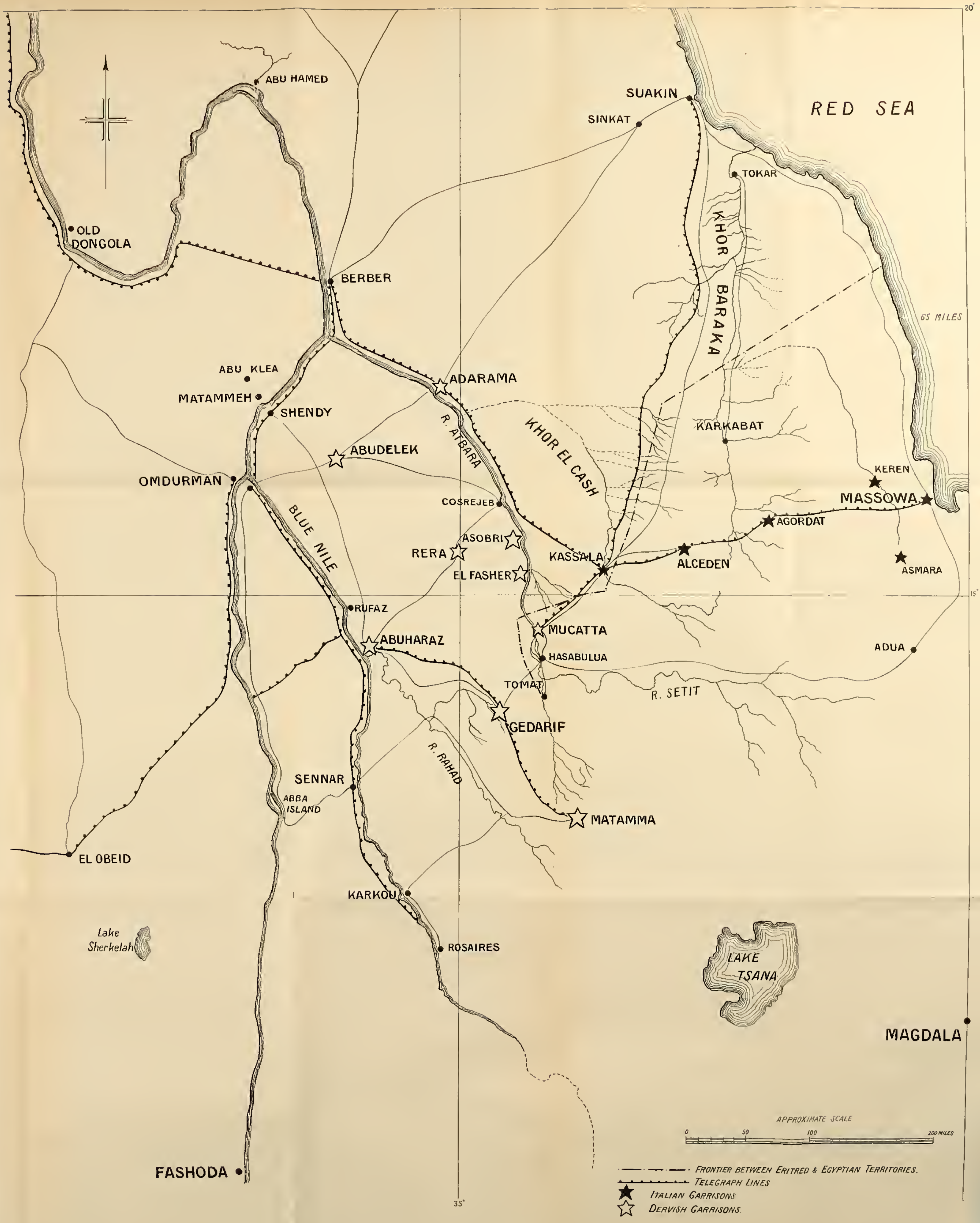
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SHENDY
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AGORDAT
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GEDARIF
R. RAHAD
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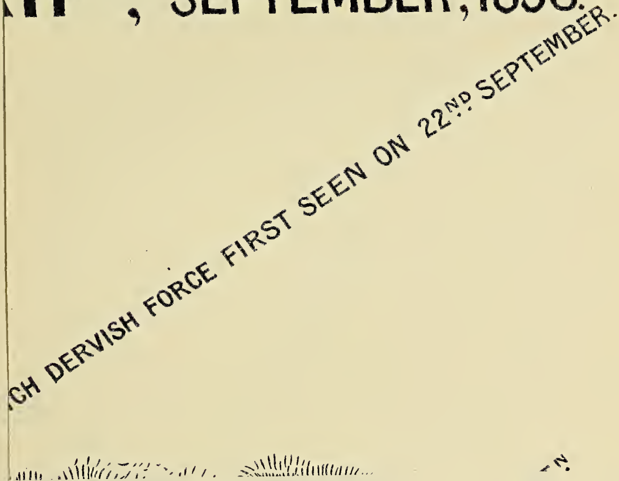

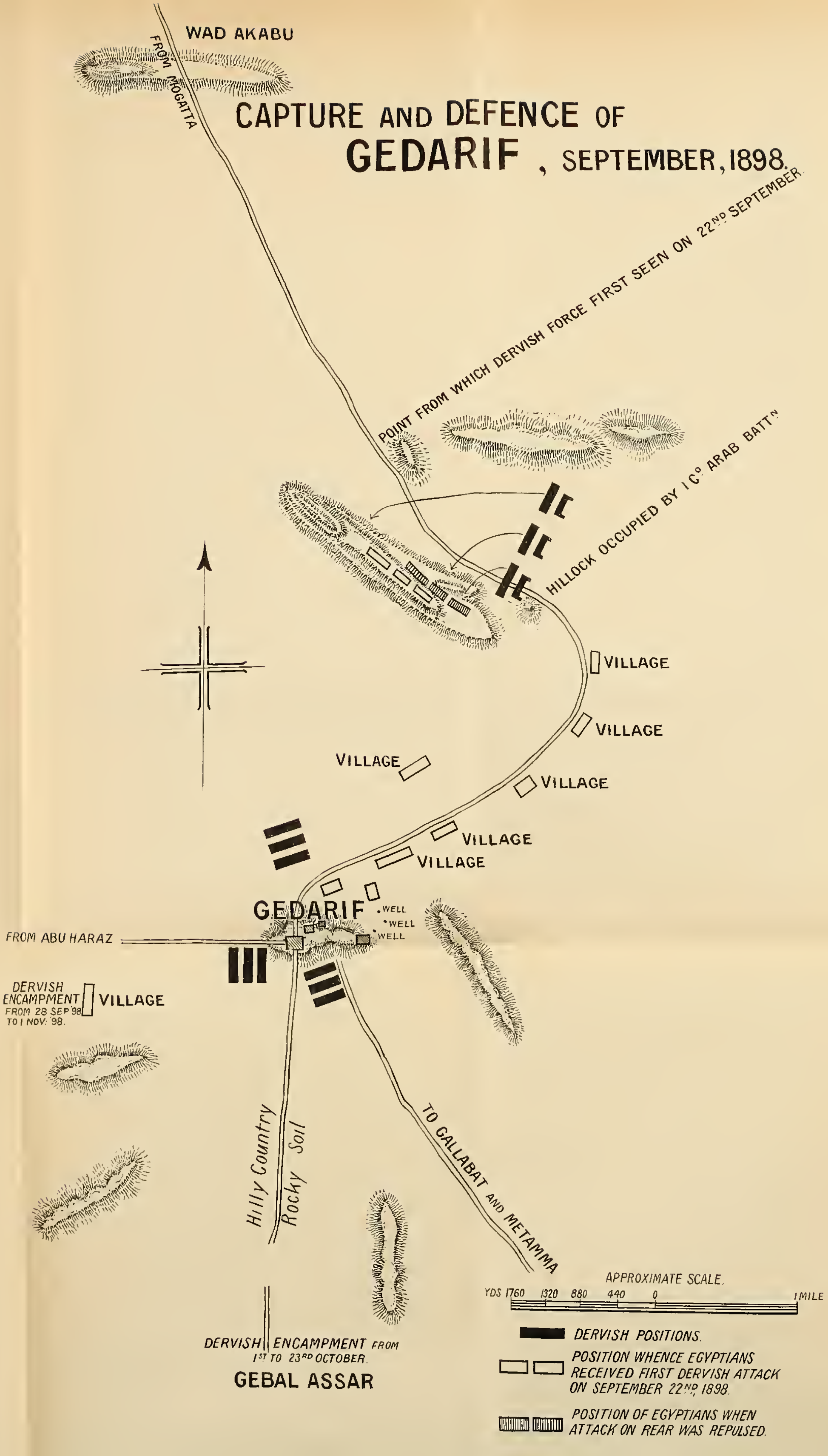

CAPTURE AND DEFENCE OF GEDARIF, SEPTEMBER, 1898.

WAD AKABU
FROM MOGATTA
POINT FROM WHICH DERVISH FORCE FIRST SEEN ON 22ND SEPTEMBER
HILLOCK OCCUPIED BY 1 Co. ARAB BATTN
VILLAGE
VILLAGE
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VILLAGE
VILLAGE
VILLAGE
GEDARIF
WELL
WELL
WELL
FROM ABU HARAZ
DERVISH ENCAMPMENT FROM 28 SEP 98 TO 1 NOV. 98.
VILLAGE
Hilly Country
Rocky Soil
TO GALLABAT AND METAMMA
DERVISH ENCAMPMENT FROM 1ST TO 23RD OCTOBER.
GEBAL ASSAR
APPROXIMATE SCALE.
YDS 1760 1320 880 440 0 1 MILE
DERVISH POSITIONS.
POSITION WHENCE EGYPTIANS RECEIVED FIRST DERVISH ATTACK ON SEPTEMBER 22ND, 1898.
POSITION OF EGYPTIANS WHEN ATTACK ON REAR WAS REPULSED.

COMMITTEE

OF THE

ROYAL ARTILLERY INSTITUTION,

1899.

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„ G. H. Bittleston.

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„ S. B. von Donop.
„ F. J. S. Cleeve.
Captain A. B. Denne.
„ G. T. Forestier- [Walker.
„ L. R. Kenyon.

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BANKERS:

Messrs. Cox & Co., and London and County Bank.

SOLICITOR:

E. W. Sampson, Esq., Woolwich.

PROCEEDINGS

OF THE

SIXTY-SECOND ANNUAL GENERAL MEETING

OF THE

ROYAL ARTILLERY INSTITUTION.

THE Meeting was held in the Lecture Theatre, Royal United Service Institution, Whitehall, on Friday, 9th June, 1899, at 3 p.m. The following members were present:—

General Sir H. Brackenbury, K.C.B., K.C.S.I., Major-Generals: J. F. Maurice, C.B., J. B. Richardson, Colonels: H. D. Buchanan-Dunlop, R. Corbett, H. T. Curling, J. C. Dalton, T. R. Disney, J. R. J. Jocelyn, H. M. Robertson, C. H. Spragge, C.B., Lieut.-Colonels: E. M. Baker, E. W. Fleming, F. O. Barrington Foote, W. L. Hutchinson, P. C. E. Newbigging, W. H. Williams, Majors: A. C. T. Boileau, R. M. Brady, F. J. S. Cleeve, A. Hamilton-Gordon, E. G. Nicolls, W. L. H. Paget, H. C. C. D. Simpson, S. B. von Donop, Captains: J. F. N. Birch, G. C. Fordyce-Buchan, G. T. Forestier-Walker, L. R. Kenyon, J. H. Mansell, H. C. Oldnall.

General Sir Henry Brackenbury, K.C.B., K.C.S.I., Director General of Ordnance, took the chair, and at the request of the Chairman the Secretary read the Annual Report as follows:—

ANNUAL REPORT.

Lectures. During the past winter season the following eight lectures were given at the Institution:—

"Synoptical Charts as applied to military subjects."
By Captain B. R. Ward, R.E., 27th October, 1898.
"Some experiences in Egypt."
By Major F. B. Elmslie, R.A., 10th November, 1898.
"The Borderland of Chemistry and Electricity."
By W. Webster, Esq., F.C.S., 24th November, 1898.
"The Trans-Siberian Railway."
By Lt.-Colonel W. H. H. Waters, M.V.O., R.A., 8th December, 1898.

"With the International Field Force in Crete."
By Major H. C. C. D. Simpson, R.A., 2nd March, 1899.

"Experiences of the 10th Field Battery in the Malakhand and Bunerwal Expeditions."
By Lieut. E. F. Delaforce, R.A., 9th March, 1899.

"Artillery features of the Naval Battle of Santiago."
By Captain C. Orde Browne, late R.A., 16th March, 1899.

"The Eastern Soudan."
By Colonel C. S. Parsons, R.A., 20th April, 1899.

LIBRARY
JUL 29 1899
PATENT OFFICE

Lectures at out-stations. The privilege of having lectures arranged and paid for at out-stations by the Institution was taken advantage of by those members stationed at Dover only, where Mr. Fred Villiers, (the artist war correspondent) lectured on "The Advance on Khartum and the Battle of Omdurman" on 22nd April 1899.

Lecture Theatre. The lighting arrangements of the lecture theatre at Woolwich have been very much improved by the installation of an arc lamp giving between 5,000 and 6,000 candle power.

Gifts to the Museum. Several very valuable additions have been made to the museum during the year, and include the following:—Two cases from Lieut.-Colonel Sir Marshall J. Clarke, K.C.M.G., *late* R.A. One containing a collection of heads, horns, skins and curios from South Africa, which he presented to the Institution and the other a quantity of weapons, consisting of assegais, spears, shield, sjamboks, knob kerries, chief's wands etc. from South Africa, which he deposited. Mrs. Whitely (the widow of the late Mr. H. Whitely who installed the museum in the present building and cared for it for more than forty-four years) presented three glass cases of birds, a young kangaroo in case, a stuffed fish in case and two water birds.

Picture Gallery. The picture gallery has been further enriched by paintings from the brushes of Lieut.-Colonel *Hon.* F. W. J. Shore, *late* R.A., and Major B. Burton, R.H.A. and the Committee have purchased the original drawings by Captain Macdonald, R.A., for the plates for the "History of the Dress of the Royal Artillery," twenty-five in number.

The Library. The library still continues to increase; all professional and scientific works of the day which are brought to the notice of the Committee and considered of sufficient interest by them are ordered, in addition to the numerous works presented, which are duly acknowledged monthly in the "Gifts and purchases" published in the *Notes by Various Hands*.

Printing House. The old gas engine was found to be so much worn that it was decided to replace it by a new and more modern one, consequently one of Crossley

Bros. new tube ignition gas engines has been purchased and placed in the old wetting down room in the basement, by this arrangement more space becomes available in the printing house and at the same time the sanitary conditions under which the compositors work are much improved.

Kane's List. The new edition of Kane's List is going through the press and will be published at the expense of the Institution at a cost of about £550. When ready for issue it will be sold to members at the lowest possible price. The information contained in the old edition will be amplified, the late General Askwith's Notes (the work of many years of the latter part of his life) will be included, and in addition to war services, the foreign and staff services of all officers of the Regiment past and present, will be given up to the end of the year 1898. With so much new information to be added and such careful editing to be done the work progresses slowly and at the present rate the edition will hardly be ready before the 31st March 1900.

Macdonald's History of the Dress of the Royal Artillery. The History of the Dress of the Royal Artillery was published at the begining of the year 1899. Although the idea of publishing such a History was conceived as far back as 1886, its having become an accomplished fact is due to the great interest taken in the subject, and the indefatigable exertions during the last seven years of the late Secretary of the R.A. Institution, Major Abdy. To his successor, Major Boileau, has only fallen the common place, though somewhat arduous task of delivering the book to the 1,050 guarantors and subscribers all over the globe and collecting the money due from the same. By this History the Regiment has received a valuable and interesting addition to its records and Capt. Macdonald, the young and talented author of the work, has stepped into fame. The London press has reviewed the book most favourably and letters of commendation have been received from officers, past and present, of the Regiment throughout the world expressing their high appreciation of it. The book contains 25 coloured illustrations which were produced by the famous firm of Goupil & C^{ie}., Paris, and as the plates of these have now been destroyed no more can be printed. Only 1,500 copies of the book were published and of these 350 were reserved for guarantors and 700 for subscribers, the remaining 450 copies being disposed of to Messrs. Sotheran & Co. for public sale.

Deaths. The number of deaths in the past year has been very large and includes the names of the following officers:

Generals: C. V. Bowie, T. E. Byrne, T. Cuming, L. H. Denne, H. M. Finlay, Sir W. H. Goodenough, K.C.B., G. Graydon, A. P. S. Green, H. L. F. Greville, C. R. Hill, T. I. M. Hog, Sir C. E. Nairne, K.C.B. H. V. Timbrell and E. A. Williams, C.B., Col. Comdt.; Colonels: W. G. Andrews, F. J. Burridge, J. D. Cunningham, W. Delane, S. Gardiner, H. W. J. Hubback, J. R. King, P. L. Macgregor, A. H. Maclean, Sir V.

D. Majendie, K. C. B., G. A. Milman, H. D. Pitt, Sir R. L. Playfair, K.C.M.G. E. Simeon, J. C. Shirres and F. M. E. Vibart; Majors: R. C. Battiscombe R. M. Crofton, C. de Jersey and C. A. Ryan; Captains: H. Calley, S. J. Chamier, A. C. Connal, A. M. de L. Cowper-Smith, G. C. Evelegh, J. D. G. Higgon, F. M. Lloyd, W. A. Matthews, Hon. R. E. M. Mostyn, C. E. Rolt, Sir N. A. Staples, Bart. and R. C. Wellesley; Lieuts.: A. F. Porcher, A. O'C. Scott and E. V. Tighe.

By the death of Sir William Goodenough, the Institution loses a good friend, one whose vast experience and valuable advice was always at the service of its members. He took a warm interest in the Institution and at one time was a frequent contributor to the "Proceedings." The following are some of the articles which fell from his pen:—"Account of a Prussian Manœuvre," "Harnessing with a Bricole or Breast Strap," "Tactical and General Instructions of the German Army," "Notes on Austrian Field Artillery Service Practice as introduced in 1872," "General Gordon on the Employment of Artillery in Irregular Warfare." He was also joint author of the first "Army Book for the British Empire." Sir William was also a donator to the Museums of specimens of mineral and natural history.

Duncan Gold Medal, 1898-9.

The subject of the essay for the 'Duncan Gold Medal for 1898–9 was "The technical training of officers in Garrison Artillery." Fifteen essays were submitted. Major-General R. Mac G. Stewart, C.B., Colonels N. L. Walford and J. C. Dalton kindly consented to act as judges. They unanimously recommended as follows:—

(1). That the Gold Medal with an honorarium of £20 be awarded to the author of the essay bearing the motto *Knowledge is power.*

(2). That the Silver Medal with an honorarium of £10 be awarded to the author of the essay bearing the motto *Sub Jove frigido.*

(3). That the essays bearing the mottos *Live and learn* and *When the strong man armed keepeth his palace his goods are in peace* are deserving of commendation and might be printed with advantage.

[The Secretary opened the sealed envelopes and announced that Major C. P. Martel is the winner of the Gold Medal, Major-General J. B. Richardson the winner of the Silver Medal and Lieutenant C. G. Vereker and Captain A. W. Pack-Beresford are commended.]

Rewards to Contributors and Translators.

Colonel J. R. J. Jocelyn, Lieut.-Colonel E. M. Baker, and Major H. C. Sclater kindly consented to act as judges to dispose of the £50 allowed annually for rewarding contributors and translators to the "Proceedings" and awarded amounts as follows:—

Colonel F. A. Whinyates	"The Services of Lt.-Col. Francis Downman, R.A., in France, North America, and the West Indies between the Years 1758 and 1784."	£5
Capt. L. R. Kenyon...	"Q.F. Field Equipments on the Continent" ...	£5
Lieut.-Colonel W. L. Hime, *late* R.A.	"Documents relating to Egypt, 1798–9" ... "Who invented the Leather Guns" ... "On the word "Gonne" or "Gun"	£4
Major C. N. Simpson	"Artillery Service under John Company" ...	£4
Lieut. G. F. MacMunn	"The Artillery at Dargai"	£4
Major-General J. B. Richardson....	"Coast Defence against Torpedo-boat attack"	£3
Colonel A. E. Turner, C.B.	"Manœuvres of the XIV German Army Corps, 1897"	£3
Major S. B. von Donop	"Logarithmic Slide Rules"	£3
Major G. E. Benson	"A Patrol on the Atbara"	£3
Brigadier-Genl. C. H. Spragge, C.B.	"Reconnaissance by Artillery"	£2
Major W. A. Urquhart, *late* R.A.	"On failures at practice with the Time and Percussion fuze" ...	£2
Capt. W. B. R. Sandys	"12-pr. Gun with Elephant Equipment ...	£2
Capt. C. G. Mackenzie	"Our Working Horses"	£2
Lieut. T. M. Kough	"The Artillery in the Rebellion of 1798" ...	£2
Lieut. C. N. B. Ballard	"The Diary of the 10th Field Battery, R.A., with the Malakand Field Force	£2

Lieut. G. C. Sturrock	"Morris Tube Practice"	£2
F.E.B.L.	"Revue d'Artillerie." The Origins of the Japanese Army ... "Revue d'Artillerie." Notes on Indurite.	£2

Lectures are not included for awards, only contributions and translations.

The judges highly appreciate Sir George Clarke's paper on *Auto-Sighting* but they consider it, as well as Colonel Watkin's and Captain Jeudwine's papers on the same subject, to be of a somewhat controversial nature and therefore forbear from advising any awards. They think Captain Orde Browne's papers on *The Development of Armour* are most valuable and recommend that he be asked to accept a special honorarium of £5. Generally they are of opinion that in the twelve numbers of the "Proceedings" (from April 1898 to March 1899) under review a high standard of excellence has been reached.

Changes in the Committee. The following changes have taken place in the Committee during the past year : –

Vice-Presidents *ex-officio*—

Gl. Sir H. Brackenbury, K.C.B., K.C.S.I. vice Lt.-Gl. Sir E. Markham, K.C.B.

Major-General W. F. M. Hutchinson retires on reduction of appointment of D.A.G. R.A.

To be members *ex-officio*—

Colonel E. O. Hay vice Maj.-Genl. A. E. Turner, C.B.
„ J. R. J. Jocelyn vice Colonel C. C. Trench.
„ C. S. Parsons vice Maj.-Genl. F. G. Slade, C.B.

To be members—

Colonel R. Corbett vice Colonel R. D. E. Lockhart
Bt.-Lt.-Colonel F. B. Elmslie vice Major H. C. Sclater.
Captain A. B. Denne vice Captain A. H. S. Goff.
„ G. T. Forestier-Walker vice Major W. E. Fairholme.
„ L. R. Kenyon on re-election.
Major H. C. Sclater vice Lt.-Colonel H. B. Jeffreys.

To be Secretary—

Major A. C. T. Boileau vice Major A. J. Abdy.

Appendices. The following Appendices are attached to the report.

A	Expenditure and Income.
B	Balance Sheet and Auditor's certificate.
C	Increase and Decrease of Members.
D (formerly *G*).	Papers published in 'Proceedings.'
E (formerly *H*).	Reports, Précis and Translations.
F (formerly *I*).	Foreign magazines and journals and their translators.

APPENDIX A.

GENERAL ABSTRACT OF THE ACCOUNTS OF THE ROYAL ARTILLERY INSTITUTION,

From 1st April, 1898, to 31st March, 1899.

EXPENDITURE AND INCOME.

1897-8 £	EXPENDITURE.	£	s.	d.	£	s.	d.
	Printing etc. — Wages—Compositors, &c.	123	12	1			
	Printing etc. — Printing Accounts	135	19	1			
162	Printing etc. — Folding, Stitching, &c.	151	6	1			
363	Printing etc. — Printing Materials	394	9	1			
137	Printing etc. — Wood Engraving and Lithography	68	10	8			
1016					873	17	0
29	Classes				15	19	0
62	Lectures				62	12	8
348	Library and Books for Sale				274	15	2
	"History of the Dress of the Royal Artillery"				1030	13	5
54	Museum				12	10	8
12	Observatory				11	10	0
	Carpentry and Repairs — Wages	23	9	6			
	Carpentry and Repairs — Materials	45	5	7			
					68	15	1
[illegible]	Stationery				6	18	8
149	Postage and Parcels				275	14	1
141	Clerks and Orderlies — Wages	151	19	4			
14	Clerks and Orderlies — Clothing	20	10	7			
					172	9	11
4	Auditors				4	4	0
3	Subscriptions to Societies				3	3	0
32	Fire Insurance				31	18	6
27	Washing and Cleaning				25	0	6
9	Subscriptions refunded				3	10	0
4	Collecting Woolwich Bills, and Christmas Boxes				3	7	6
102	Medals, Honoraria and Rewards				88	0	0
15	Arrears of Subscriptions written off				3	18	6
26	Mrs. Bryant				26	0	0
					2994	17	8
	Balance, being surplus of Income over Expenditure for the year ending 31st March, 1899.				213	18	9
2166					£3208	16	5

1897-8 £	INCOME.	£	s.	d.	£	s.	d.
150	Amounts charged to Members for — Printing	204	12	2			
247	Amounts charged to Members for — Books, &c.	157	5	8			
32	Amounts charged to Members for — Postage and Parcels	23	12	1			
2	Amounts charged to Members for — Carpentry	26	4	1			
					411	14	0
431	"History of the Dress of the Royal Artillery"						
	Subscriptions, Postage, &c., received	132	9	6			
	Subscriptions, Postage, &c., due	913	19	0			
					1046	8	6
101	Entrance Fees and Subscriptions for 1898-99. — Entrance Fees—Received	97	0	0			
1492	Entrance Fees and Subscriptions for 1898-99. — Subscriptions—Received	1523	10	0			
34	Entrance Fees and Subscriptions for 1898-99. — Subscriptions—Outstanding	26	4	8			
					1646	14	8
99	Dividends for a year on £3739 1s 9d. Consols less Income Tax				99	8	0
4	Interest on Bank Deposit				4	11	3
2161							
5	Balance being excess of Expenditure over Income, for the year ending 31st March, 1898.						
2166					£3208	16	5

FUND

st MARCH, 1899.

	ıditure.							£	s.	d.
	....							5	15	11½
	’s account)							5	12	7
By	£5000..							18	15	0
"	....							36	10	0
"	....							9	2	6
	....							0	9	0
"	....							4	4	10
"		Royal Artillery Band.			Mounted Band					
		£	s.	d.	£	s.	d.			
	es	145	5	3	4	16	6			
	;es	96	12	4	20	7	10			
	es, &c.	20	11	9	13	18	9			
	....	1054	2	10	343	6	8			
	....	30	15	8	2	6	8			
	....	9	2	0	—					
	....	20	0	0	9	0	0			
	ıts	2	11	11	—					
	....	2	3	9	0	12	0			
	ms and Stables	2	10	6½	4	13	0			
	....	32	3	11	—					
	....	14	4	8	6	12	0			
	ıls	1430	4	7½	405	13	5	1835	18	0½
	1st March, 1899							457	6	3
	Total....................							£2373	14	2

T.

	Assets.	£	s.	d.
Sub	rch, 1899	28	18	6
Due	ximately)	30	0	0
	....	457	6	3
Not in				
£				
	Total...	£516	4	9

.-Colonel R.A., *President.*

Secretary & Treasurer.

ROYAL ARTILLERY BAND FUND

GENERAL CASH ACCOUNT FOR THE YEAR ENDED 31st MARCH, 1899.

Income.	£	s.	d.
Balance in hand on 31st March, 1898	315	14	6
By Subscriptions received	1925	17	6
" Government Grant for 1898-9	100	0	0
" Sale of old Instruments	1	4	6
" Rebate of Income Tax for 1897-8.	30	0	0
" Extra discount from Rudall & Co., on new Instruments	0	17	8
TOTAL	£2373	14	2

Expenditure.	Royal Artillery Band. £	s.	d.	Mounted Band £	s.	d.	£	s.	d.
To Postal Expenses							5	15	11½
" Printing and Stationery (Secretary's account)							5	12	7
" Insurance to Michaelmas, 1899, on £5000							18	15	0
" Allowance to Clerk							36	10	0
" " Pay Sergeant							9	2	6
" Cheque Books							0	9	0
" Miscellaneous							4	4	10
" Purchase of Instruments, and Cases	115	5	3	4	16	6			
" Purchase of Music, Stands, and Cases	96	12	4	20	7	10			
" Repair of Instruments, Stands, Cases, &c.	20	11	9	13	18	9			
" Pay of Master and Musicians	1054	2	10	343	6	8			
" Clothing	30	15	8	2	6	8			
" Lodging Allowance	9	2	0	—					
" Arranging and Copying Music	20	0	0	9	0	0			
" Postage and Carriage of Instruments	2	11	11	—					
" Stationery and Printing	2	3	9	0	12	0			
" Fuel and Articles for Practice Rooms and Stables	2	10	6½	4	13	0			
" Violin and other Strings	32	3	11	—					
" Reeds and Drum-heads	14	4	8	6	12	0			
Totals	1430	4	7½	405	13	5	1835	18	0½
Balance in hand on 31st March, 1899							457	6	3
TOTAL							£2373	14	2

GENERAL STATEMENT.

LIABILITIES.	£	s.	d.
Subscriptions for 1899–1900 received in advance	18	12	2
Due to Boosey & Co., for quarterly bill	19	4	2
Balance credit, 31st March, 1898	478	8	5
Not including Instruments, Music, &c., which are insured for £5000.)			
TOTAL	£516	4	9

ASSETS.	£	s.	d.
Outstanding Subscriptions to 31st March, 1899	28	18	6
Rebate of Income tax 1898-9, (approximately)	30	0	0
Cash in hand as above	457	6	3
TOTAL	£516	4	9

F. O. BARRINGTON-FOOTE, Lieut.-Colonel R.A., *President.*
R. J. MACDONALD, Captain R.A., *Secretary & Treasurer.*

APPENDIX B.

BALANCE SHEET.—31st March, 1899.

1898 £	Dr. Liabilities, &c.	£ s. d.	£ s. d.
	To Sundry Creditors, viz.:		
	Accounts for goods, Printing, &c., owing by the Institution and included in Expenditure for the year 1898-9		
186	General expenditure	127 9 7	
	"History of the Dress of the Royal Artillery"	454 19 11	
34	Amount to credit of Members on current Accounts.	9 15 1	592 4 7
220	N.B.—Prior to the 31st March orders had been placed relating to the production of Kane's list, but the work in connection therewith was not sufficiently advanced to admit of its introduction into the present accounts.		
19	To Members' Subscriptions paid in advance.		23 10 0
	" Cox & Co., overdrawn balance on current account		124 1 1
239			739 15 8
4363	" Balance being surplus of Assets or "Accumulated Fund" at 31st March, 1899.		4577 8 0
	viz.:—		
	Surplus at 31st March, 1898	4363 9 3	
	Add.—Surplus Income for the year ending 31 March, 1899, as per Expenditure and Income account.	213 18 9	
		4577 8 0	
	N.B.—This Surplus is in addition to the value of the contents of the Museum and Library, Instruments, Furniture, Fixtures, &c., belonging to the Institution, which the Committee have estimated at £12,000, and which are insured in the Sun Fire Office for that sum.		
4602			£5317 3 8

1898 £	Assets.	£ s. d.	Cr. £ s. d.
601	By Cash in hand and at Bankers, including £300 on Deposit Account at Interest		373 14 4
	Sundry Debtors, viz.:		
138	Amount owing by Members on current Accounts included in Income	130 2 1	
	Amount owing for subscriptions to "History of the Dress of the Royal Artillery," included in Income for 1898-9	913 19 0	
39	Amount owing by Members for subscriptions included in Income	31 18 8	
			1075 19 9
88	" Stocks on hand viz.: Printing paper.	134 5 7	
44	Books for Sale	40 15 10	
			175 1 5
3692	" Investments, viz.: £3739 1s. 9d. Consols at cost		3692 8 2
4602			£5317 3 8

AUDITORS' CERTIFICATE.

We have compared the foregoing Accounts with the monthly Cash Accounts audited by the Committee and with the books of the Institution and certify the same to be correct. We have also examined portions of the Cash and Ledger Accounts with the vouchers and have found them in order and have verified the Cash Balances and the Investment in Consols.

AGAR, BATES, & Co.,
Chartered Accountants.

13th May, 1899.

APPENDIX C.

Statement shewing Increase and Decrease of Members of the Instituton during the year ending 31st March, 1899.

Ranks	1st April, 1898.	Increase.			Total Increase.	Decrease.				Total Decrease.	Balance.		31st March, 1899.
		Promotions.	Retirements.	New Members.		Promotions.	Retirements.	Withdrawals.	Deaths.		Decrease.	Increase.	
EFFECTIVE LIST.													
Generals and Field Officers	444	49	—	2	51	—	31	2	6	39	—	12	456
Captains	441	93	—	2	95	49	8	1	8	66	—	29	470
Lieuts. & 2nd Lieuts.	715	—	—	93	93	93	9	3	1	106	13	—	702
Veterinary Surgeons	1	—	—	—	—	—	—	—	—	—	—	—	1
Quarter-Masters ...	2	—	—	—	—	—	—	—	—	—	—	—	2
Riding Masters ...	2	—	—	—	—	—	1	—	—	1	1	—	1
RETIRED LIST.													
Generals and Field Officers	218	—	31	—	31	—	—	12	12	24	—	7	225
Captains	89	—	8	—	8	—	—	6	1	7	—	1	90
Lieuts. & 2nd Lieuts.	33	—	9	—	9	—	—	1	—	1	—	8	41
Paymasters ...	2	—	—	—	—	—	—	—	—	—	—	—	2
Riding Masters ...	1	—	1	—	1	—	—	—	—	—	—	1	2
Medical Officers .	2	—	—	—	—	—	—	—	—	—	—	—	2
Chaplains	1	—	—	—	—	—	—	—	—	—	—	—	1
HONORARY MEMBER	36	—	—	7	7	—	—	—	1	1	—	6	42
Totals ...	1987	142	49	104	295	142	49	25	29	245	14	64	2087

APPENDIX D.

List of Papers published in the "Proceedings" during the year.

The Services of Lieut.-Colonel Francis Downman, R.A., in France, North America, and the West Indies, between the years 1758 and 1784. Edited by Colonel F. A. Whinyates, late R.H.A.

The Artillery at Dargai. By Lieutenant G. F. MacMunn, D.S.O., R.A.

Documents relating to Egypt, 1798–9. Communicated by Lieut.-Colonel H. W. L. Hime.

Manœuvres of the XIV German Army Corps, 1897. By Colonel A. E. Turner, C.B., A.-A.-G., R.A.

12-pr. Gun with Elephant Equipment. By Captain W. B. R. Sandys, R.A.

The Megaphone as a Garrison Artillery adjunct. By Lieut.-Colonel J. C. Dalton, R.A.

The Teaching of Mechanics by Experiment. By J. A. Ewing, Esq., F.R.S., Professor of Mechanism and Applied Mechanics in the University of Cambridge. (*A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday, 10th, Feb. 1898.*)

Automatic Sighting. By Colonel H. S. S. Watkin, C.B., R.A., Chief Inspector of Position Finding.

Abstract of the Proceedings of the Sixty-First Annual General Meeting of the Royal Artillery Institution.

The Advantages and Disadvantages of Q.F. Guns for Artillery in the Field. (Silver Medal Prize Essay, 1898.) By Major F. B. Elmslie, R.A.

The Advantages and Disadvantages of Q.F. Guns for Artillery in the Field. (Silver Medal Prize Essay, 1898.) By Major N. B. Inglefield, R.A.

The Advantages and Disadvantages of Q.F. Guns for Artillery in the Field. (Commended Essay, 1898.) By Captain R. A. K. Montgomery, R.A.

The Advantages and Disadvantages of Q.F. Guns for Artillery in the Field. (Commended Essay, 1898.) By Captain H. W. Barlow, R.A.

The Advantage and Disadvantages of Q.F. Guns for Artillery in the Field. (Commended Essay, 1898.) By Lieutenant A. S. Buckle, R.A.

The Mechanism of Bicycles. Illustrated by specimens and drawings. By Major S. B. von Donop, R.A., Professor of Artillery at the Royal Military Academy. (*A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday, 10th March, 1898.*)

The Artillery in the Rebellion of 1798. By Lieutenant T. M. Kough, R.A.

The Diary of the 10th Field Battery, R.A., with the Malakand Field Force. By Lieutenant C. N. B. Ballard, R.A.

Quick-fire guns for Field Artillery. A discussion of the essays rewarded and published in the 'Duncan' Gold Medal Competition, 1898. *Held at the Royal United Service Institution, Whitehall, Wednesday, 13th July, 1898.*

The development of armour during the years 1893–98. By Captain C. Orde Browne, late R.A.

On the word "Gonne" or "Gun." By Lieut.-Colonel H. W. L. Hime, late R.A.

Practice seawards. By Captain J. H. Mansell, R.A.

Morris Tube Practice. By Lieutenant G. C. Sturrock, R.A.

Q.F. Field Artillery fire. By Lieutenant C. H. Wood, R.H.A.

Observations on Mr. Kinglake's Narrative of the bombardment of Sebastopol in April, 1855. By Colonel F. A. Whinyates, late R.H.A.

On failures at practice with the Time and Percussion Fuze, Mark IV. By Major W. A. Urquhart, late R.A.

Röntgen Rays up-to-date. *Précis of a Lecture delivered at the Royal Artillery Institution, Woolwich, 27th January, 1898.* By W. Webster, Esq., F.C.S.

Marching through jungle across India. By Major P. H. Enthoven, R.A.

Reconnaissance by Artillery. By Brigadier-General C. H. Spragge, C.B.

Who invented the Leather Guns? By Lieut.-Colonel H. W. L. Hime, late R.A.

Artillery Service under "John Company." By Major C. N. Simpson, R.A.

Coast Defence against Torpedo-boat attack. By Major-General J. B. Richardson

A Patrol on the Atbara. By Major G. E. Benson, R.A.

Some Experiences in Egypt. By Major F. B. Elmslie, R.A. *Précis of a Lecture delivered at the Royal Artillery Institution, Woolwich, on 10th November, 1898.*

Artillery used in recent campaigns in Egypt and its effects. *A Discussion held at the Royal Artillery Institution, Woolwich, on Tuesday, 29th November, 1898,*

Logarithmic Slide Rules. By Major S. B. von Donop, R.A.

The Trans-Siberian Railway. (*A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday, 8th December, 1898.*) By Lieut.-Colonel W. H. H. Waters, *M.V.O.*, D.A.A.G.

Our Working Horses. By Captain C. G. Mackenzie, R.A.

Auto-Sighting. By Colonel Sir G. S. Clarke, K.C.M.G., F.R.S., R.E.

Automatic-Sighting. By Captain H. S. Jeudwine, R.A.

Q.F. Field Equipments on the Continent. By Captain L. R. Kenyon, R.A.

Cannon at Cressy. By Lieut.-Colonel H. W. L. Hime, late R.A.

APPENDIX E

Precis and Translations Published during the Year.

FRENCH . . .	"Revue d'Artillerie." The Origins of the Japanese Army. By F.E.B.L. "Revue d'Artillerie." Notes on Indurite. By F.E.B.L. "Revue Militaire de L'Etranger," July 1898. Competition of war-dogs. By Colonel J. H. G. Browne, *late* R.A.

APPENDIX F.

LIST
OF
FOREIGN MAGAZINES AND JOURNALS
TAKEN IN BY THE
R.A. INSTITUTION;
WITH THE NAMES OF OFFICERS WHO HAVE UNDERTAKEN TO SUPPLY PRÉCIS AND REVIEWS OF THEIR CONTENTS FROM TIME TO TIME.

COUNTRY.	NAME OF JOURNAL, &c.	TRANLATOR.
France	Spectateur Militaire	—
	Journal des Sciences Militaires	—
	Revue d'Artillerie	Lt.-Col .F E.. B. Loraine
	Revue Militaire de l'Etranger	Lt.-Col. J.H.G. Browne, late R.A., and Major E. J. Granet.
Spain	Memorial de Artilleria.. ...	Colonel J. C. Dalton.
	Revista Técnica de Infanteriay Caballeria	—
Germany	Neue Militärische Blätter ...	2nd Lt. W. F. Reichwald
	Militär-Wochenblatt	Capt. A. B. Denne.
	Jahrbücher für die Deutsche Armee und Marine ...	—
	Allgemeine Militär und Sport Bibliographie	—
	Kriegstechnische Zeitschrift ...	—
Austria	Organ der Militär-Wissenschaftlichen Vereine...	—
	Militärische Zeitschrift...	—
	Mittheilungen, &c., des Artillerie und Genie-Wesens	—
Italy	Rivista di Artigleria e Genio	Major R.M.B.F.Kelly.
	„ Marittima ...	Major A. Samut, A.O.D.
Russia	Journal of Artillery ...	Major E. A. Lambart. Major G. T. Kelaart.
	Russki Invalid	Capt. E. G. Cheke.
	Oruzhennii Sbornik	—
Sweden	Artilleri-Tidskrift	—
	Tidskrift Sjöväsendet	—
Switzerland	Revue Militaire Suisse... ...	—
Belgian ...	Revue de l'Armée Belge ...	—
Roumania	Cercul Publicatiunilor Militare	—
Brazil ...	Revista Maritima Brazileira ...	—

The appendices were taken as read.

The Chairman :—Does anyone wish to make any remark on the annual report or on the accounts ?

General Maurice :—We should be glad, Sir, if you yourself would look into the accounts.

The Chairman :—I see we have spent £213 8*s* 9*d* less than our income last year which is very satisfactory so long as we do not stint any of the services. I see the "History of the Dress of the Royal Artillery" cost £1,030 13*s* 5*d*. How much of that do you get back ?

The Secretary :—It is all recoverable.

The Chairman :—Yes £1,046. That is all recoverable and with a small margin. Do the Auditors only get £4 4*s*. 0*d*. ?

The Secretary :—That is all.

The Chairman :—The accounts seem very satisfactory. The value of our investments is £3,692, and cash and stocks in hand etc. make it up to £5,317. Does anybody else wish to make any remarks upon the accounts ?

General Maurice :—There is one point I should like to draw attention to, and that is the nature of the certificate given by the Chartered Accountants. In talking to them about it, I found that they are most careful to so word their certificate to us that practically it does not give us any very particular guarantee. They themselves say it is a most guarded statement. Now, though we have the utmost confidence in the successive Secretaries of the Institution it seems to me that we ought to have a Chartered Accountant's examination as an absolute guarantee to us of the correctness of the accounts. Exactly by what qualification they limit it I do not quite understand : but they themselves say distinctly that they could not go thoroughly into the accounts on the terms which we offer them. I think it would be much better for the Institution another year to have such terms with the Chartered Accountants that they will give a thoroughly sufficient examination to the accounts and give an absolute guarantee of their correctness.

The Chairman :—On what particular point do you think it is desirable that the Auditors might go more carefully into the accounts ?

General Maurice :—I do not know further than this, that in speaking to the Auditor when he made his examination he said " you will notice that we give you an exceedingly guarded guarantee." I do not think that is satisfactory. I think we ought to have an absolute guarantee from them that they have given a complete investigation of the accounts. I believe practically it is a question of the extent of the charge. There is a £4 audit and there is a £10 audit. We pay a £4 audit and had much better pay a £10 audit. Here is another form of audit (reading the same).

The Chairman :—In our case they have verified the cash balance and the investments in consols ; of course they have not verified the value of our stock in hand.

General MAURICE :—Practically they are dependent upon the report of the Secretary. Now I am quite sure we may trust our Secretaries to do their best for us ; but it is one thing to have an amateur dealing with accounts and another to have an expert.

The CHAIRMAN :—It might be satisfactory to pay a higher fee and get more, but is not that a matter for the Committee ?

General MAURICE :—I understood when we raised the question on Committee we were told we could not do it without the authority of the General Meeting.

The CHAIRMAN :—I thought it was within the power of the Committee.

The SECRETARY :—I noted in the last monthly Committee Minutes to bring it up next year.

General MAURICE :—I thought it was necessary to bring it up before this meeting. However if the Committee can do it it does not matter.

Report adopted & Accounts passed.

The annual report was then adopted and the accounts for the year ended 31st March, 1899 passed, unanimously.

FURTHER BUSINESS.

Votes of thanks.

Votes of thanks were unanimously accorded to the Judges of the Prize Essays, and to the Judges of Awards.

Honoraria Granted.

Honoraria of £5 each were voted to Lieutenant C. G. Vereker and to Captain A. W. Pack-Beresford, the authors of the commended essays, and a special honorarium of £5 to Captain Orde Browne for his valuable paper on *The Development of Armour.*

Subject for Duncan Gold Medal Essay 1899-1900.

The CHAIRMAN : The next business before us is the choice of a subject for the 'Duncan Essay' for the ensuing year. It must be a Field Artillery subject. Each member will make a mark against the subject he thinks the most suitable one on the printed slips which have been placed on the seats ; or if any member wishes to propose any other subject it is not too late ? There being apparently no further proposals we will proceed to choose one of the following :—

(1). The *rôle* and tactical organization of Heavy Field Artillery as exemplified by the Field Howitzer and Volunteer Position Batteries of our Home Establishment and the Heavy Batteries of our Indian Establishment.

(2). Now that Q.F. guns and smokeless powder have been introduced, should any change be made in the tactics and the positions taken up by Field Artillery ?

(3). The high angle fire of Field Artillery.

(4). The tactical conditions of the employment of Field Howitzers.

(5). The constitution and duties of the Corps Artillery of an Army Corps.

The voting papers having been collected it was found that there were four votes for (1), fourteen for (2), one for (3), three for (4), and two for (5). No. (2) was declared the subject chosen for the 'Duncan Gold Medal Prize Essay' for 1899–1900, and if approved by the War Office Authorities will be publicly announced as such.

Amendments to Rules.

The CHAIRMAN: Now we go on to the amendments to the Rules brought forward by the Committee for adoption at this meeting.

Rule II. as it now stands :—

Officers of the Royal Engineers, Royal Marine Artillery, Professors and Instructors of the Royal Military Academy and Artillery (not being Royal Artillery officers), and officers of Colonial Artillery are eligible to become honorary members.

Officers of the Army and Navy and Colonial regular forces, or in the reserve forces who are ineligible to become honorary members, may obtain the periodical publication of "Proceedings" on annual payment in advance of 15s.

The Committee shall have power to elect as honorary members such gentlemen connected with naval and military arts and sciences as they from time to time think fit; and, for short periods, officers of the army and Navy who may be temporarily in the garrison or neighbourhood.

Proposed Amendment:—

Para. 1.—To read *Officers of the regular Army, Navy and Marine forces whether on full, half, or retired pay, Professors etc.*

The CHAIRMAN: Is it your pleasure gentlemen that this amendment of the rule should be adopted? It is a very sweeping one but is recommended by your Committee, and has the virtual effect of opening the Royal Artillery Institution to officers of the Regular Army, Navy and Marine Forces whether on full, half, or retired pay.

General MAURICE: It does not go further than that the Committee shall have the power to elect as honorary members, such gentlemen. It leaves us a certain latitude, if an officer comes up who has done us a considerable service.

The amendment was agreed to.

Proposed Amendment:—

Para. 2.—To read *Officers of the Militia, Volunteers, Yeomanry and Colonial regular forces may obtain the periodical* . . . ".

The CHAIRMAN: You will see that under the rule as it stands only officers of the Army, Navy and Colonial Regular Forces and in certain cases officers of the Reserve Forces may obtain the publication of "Proceedings," but the amendment enables all officers of the Militia, Volunteers, Yeomanry and Colonial Regular Forces to obtain them.

The amendment was agreed to.

Proposed Amendment:—

Para. 3.—To conclude " . . . *and for short periods gentlemen professionally connected with the Army or Navy in the neighbourhood of Woolwich.*"

The CHAIRMAN: I am not quite sure I know what this means.

General MAURICE: There are a good many people at the Ordnance College and other places who are temporarily connected with it and it will leave a discretion to the Committee. There is nothing mandatory about the amendment, it is only permissive.

The amendment was agreed to.

Rule IV. as it now stands:—

IV. Any member who, whilst serving on full pay, shall cease to belong to the Royal Artillery Institution, either by resignation or otherwise, shall not again be eligible for admission, without paying all arrears of annual subscription since the date of his last payment.

Proposed amendment:—

For "Shall not again be eligible . . . . his last payment" read "*shall be eligible for re-admission on payment of another entrance subscription of £1.*"

General MAURICE: There are a good many officers who would rejoin the Institution, who have withdrawn from it in their early days, and it was strongly recommended to us by our new Secretary that we should relax the rule, as practically a good many officers were kept out by having to pay up a long series of arrears. It has hitherto been obligatory upon everybody who rejoined to pay up all arrears and a good many officers are kept out by it. The amendment will merely make it rather easier to let officers in again who are desirous of coming in.

The SECRETARY: I have a list of officers whom I know of my own knowledge are willing to rejoin the Institution if the prohibitive conditions in Rule IV. as it now stands were withdrawn; in fact one or two have already rejoined in anticipation of this amendment being passed. There are some who would have had to pay up twenty years of back subscriptions under the present rule, which is so prohibitive that it makes it out of the question for any ex-member whose name has been off the books for any length of time to rejoin. I have no doubt if this amendment is carried it will have the effect of largely increasing our subscription list.

The amendment was agreed to.

Rule V. as it now stands:—

H.R.H. the Commander-in-Chief, Colonel of the Royal Artillery, to be Patron and President of the Institution.

The General Officer Commanding Woolwich District, the Director of Artillery, the Deputy-Adjutant-General, R.A., and such other officers as may be specially elected at a general meeting to be Vice-Presidents. The affairs of the Institution to be under the direction of a Committee, consisting of the above officers, the Assistant-Adjutant-General, R.A., the Director of Artillery College, the Assistant-Adjutant-General, Woolwich, the Secretary, Ordnance Committee, and fifteen officers elected at the annual general meeting, of whom four shall be Colonels or Lieut.-Colonels, the senior to take the chair. Any member of the Committee doing regimental duty, and not attending one Committee in six months, shall cease to be a member, and shall be ineligible for re-election for one year.

Proposed amendments :—

Lines 1 and 2 to read "*H.R.H. The Duke of Cambridge, Colonel-in-Chief of the Royal Artillery, to be Patron and President of the Institution.*"

Lines 3 and 4.—Delete "*Director of Artillery, the Deputy-Adjutant-General, R.A.,*" and insert "*The Director-General of Ordnance, and the President of the Ordnance Committee.*"

Line 7 after "*Assistant-Adjutant-General, R.A.*" insert "*the Commandant, School of Gunnery, Shoeburyness, the Assistant Military Secretary, R.A., Army Head-quarters, the Colonel-on-the-Staff Commanding Royal Artillery, Woolwich.*"

The SECRETARY : The amendments are for the most part necessitated by recent changes in the Army. If they are passed the result will be that the *ex officio* members of the Committee will be increased by three and the elected members decreased by one, making a nett increase in the whole Committee of two members. The decrease is due to the fact that Colonel Corbett, who is an elected member, would become an *ex officio* member by reason of his being the Colonel-on-the-Staff, Commanding Royal Artillery, Woolwich District.

The amendments were agreed to.

Proposed new paragraph :—

"*No one other than a member of the Royal Artillery Institution is eligible to be a Vice-President or member of the Committee.*"

The SECRETARY : This new paragraph is to provide for the contingency of any of the holders of the appointments which make Vice-Presidents or Ex-officio Members of the Committee not belonging to the Royal Artillery, or, if they belong to the Royal Artillery, not being members of the Institution.

The new paragraph was agreed to.

Proprsed amendment :—

Line 11.—Delete "*regimental*" before "*duty*" and insert after "*duty*" the words "*at Woolwich.*"

The SECRETARY : This is to make the rule about non-attendance at Committee Meetings applicable to all members of the Committee and not only to duty officers.

Colonel CORBETT : It only means they have to attend a meeting once in six months so it is not a very severe measure.

The amendment was agreed to.

Rule XVI. as it now stands :—

A meeting of the Committee to take place once in every month, or on such other days as the Committee shall appoint; three members to form a quorum.

Proposed amendment :—

After "*quorum*" insert "*of whom the Secretary or Assistant Secretary may be one.*"

The SECRETARY : This is to permit of the Secretary or Assistant-

Secretary being allowed to count towards a quorum although I am glad to say there has been no difficulty in forming one during the last six months as we have had very full Committee Meetings. The Secretary will have all the privileges of a member of Committee (except voting for his successor) if this amendment is passed.

The CHAIRMAN: It might prevent a meeting from breaking down.

The amendment was agreed to.

Extract from Rule XIX. as it now stands:—

LANGUAGE OR SCIENCE.	PROPORTION.
French, German and Freehand Drawing	Nil.
Italian, Spanish, Portuguese, Danish, Swedish	½ tuition fees.
Russian, Turkish and Arabic	⅔ tuition fees, provided the amount be refunded. 1st, If the recipient fails to obtain ·5 within 2 years. 2nd, If he obtains the Government reward.
Photography, Mechanism & Steam	½ tuition fees and purchase of instruments at the discretion of the Committee.
Astronomy and Surveying	½ tuition fees charged by the Royal Geographical Society, provided the recipient satisfy the Council of that Society as set forth in their letter dated 22nd March, 1897.

Proposed amendment:—To insert

High and Cape Dutch	*½ tuition fees, provided certificate of interpretership is obtained in Cape Civil Service Examination.*

The SECRETARY: As is well known the Institution renders pecuniary assistance to its members in the study of various languages and sciences as set forth in the table contained in Rule XIX. It is now proposed to add Dutch to the list of languages for which half tuition fees are allowed. This move is the out come of a recommendation of the late Sir William Goodenough who brought forward very strongly the desirability of officers serving in South Africa being conversant with both High Dutch and Cape Dutch. I must admit that I had to write to Colonel Trotter, the C.R.A. at Cape Town, to find out the difference between these two kinds of Dutch as no member of the Committee was able to inform me. (Laughter). High Dutch is the language spoken and written in Holland, and is also the official language out at the Cape; Cape Dutch is the patois spoken in South Africa; it contains many Kaffir words and has no inflections; it is practically a spoken and not a written language, though the Afrikanders make an attempt to write it. There is absolutely no rule for spelling words. Colonel Trotter himself has qualified as an Interpreter in both languages obtaining a certificate at the Cape Civil Service examinations, as also has 2nd Lieutenant A. N. Campbell.

The amendment was agreed to.

Election of a new member of Committee.

The SECRETARY:—There appears to be a discrepancy in the Rules as regards the election of the Committee. Rule V. says 'elected at the Annual General Meeting,' whereas Rule VIII. says 'In case of the death or retirement of any member of the Committee during the interval of the Annual General Meetings, the vacancy to be filled up by the Committee at their next meeting.' As vacancies usually occur during the interval, they are generally filled up by the Committee, but as this particular vacancy occurred just about the date of the general meeting, the Committee thought they would bring it up as a kind of a test case, and they would like to be informed by this general meeting on the point, viz., whether a new member of the Committee should be elected by the Committee or by the general meeting? In one case it would be the voice of the whole of the members of the Institution, in the other it would simply be the Committee themselves continuing on their succession to officers of their own choice.

The **Chairman**: It is customary in commercial and other concerns if a vacancy occurs during the interval on the body of Directors, for that vacancy to be filled up by the Directors, for the time being, subject to the approval and vote of the annual meeting. But when men go out regularly by rotation, it is the custom for it to be done entirely at the general meeting. Have you anyone to propose, General Maurice?

The **Secretary**: General Maurice will allow me to say that the Committee discussed this at their last meeting and they unanimously resolved to submit the name of Lt.-Colonel T. Perrott to the general meeting; he has been written to and is willing to accept office. They desire that the new member shall be an officer with a wide experience of Siege Artillery.

The **Chairman**:—Has anyone any other name to propose, if so they had better put it in the form of an amendment?

No other proposals being made Colonel Perrott was unanimously elected a member of the Committee vice Major G. N. H. Barlow whose three years have expired.

The **Chairman**:—If any gentlemen has any business to bring forward before we wind up the meeting I should be very glad to consider it (a pause). Then, gentlemen, I think we may bring the meeting to a close. The business seems to be all finished. I am a little bit sorry that in the Annual Report no notice has been taken of what I think is the most interesting thing that happened in the whole year, which was that meeting at the R.A. Institution on 29th November last, when we had that discussion on Lt.-Colonel Elmslie's lecture on his experiences in Egypt which I most sincerely hope will be only the beginning of a series of those we shall have after every campaign that takes place whether there is a lecture or not. It seems to me that we ought at the Institution after every campaign to try to get the men together who were engaged in it and have a thorough discussion over the whole of the work that they did, especially in connection with the *matériel* used, to try to bring out what improvements are required and get from them what suggestions we can for changes in our tactics and so on.

There is another matter that I cannot pass over without a personal remark or two, and that is this list of deaths. I feel, as has been said in the report, that the Royal Artillery Institution as a body have sustained a very great loss in the death of my old friend Sir William Goodenough. Everyone who knew him respected him. There was no man who was a more thorough and conscientious soldier. There is another whose name, though given in the report, has been passed over without any special mention, and that is Sir Vivian Majendie, who was for many years a well known gunner, and then went to that important post of Inspector of Explosives, for the Home Office. He has done a great deal really for us, as well as for the civilian population of the country, by his studies in everything connected with the cause of explosions and the proper method of storing explosive compounds. He was not very long ago, President of the Danger-Building Committee, which has practically settled for us how our danger-buildings should be constructed, and I think he is a great loss to the Institution, of which, at one time, I know he was very fond, and with which he was closely connected.

I have only to say in conclusion that I hope the Institution will go on and do as good work in the future as it has done in the past and that it will devote itself as much as is possible to what may be really called the professional work of our own profession; and it is in connection with that specially that I have suggested that we should have an occasional meeting for discussion—not necessarily preceded by a lecture at all—on important matters connected with our own profession. There are every now and then proposals made for discussions on subjects which at the moment it would not be wise to discuss. Those we must steer clear of. But, on the other hand discussions upon many subjects I think might with great advantage be held at the Institution. Gentlemen, I have to thank you for your attendance here to-day in such great numbers.

The proceedings then terminated with a vote of thanks to the Chairman.

A SMALL FIGHT ON THE INDIAN FRONTIER.

— BY —

CAPTAIN G. R. LAMB, R.A.

AS the centre section of my Battery were actors in a rough night-and-day's work, and had some unusual experiences, I shall attempt to give some account of it :—

Edwardesabad, (or Bannu) and the neighbourhood, in the Punjab Frontier Force District, is notorious as the haunt of many Pathan outlaws, who have committed murders and outrages, too often with impunity, as they can run across the border in an hour or two. The Politicals having learnt of the presence of several such men, who were wanted by Government, a small column was ordered out to surprise, surround and capture them in Gumatti village, situated about nine miles from Bannu in the territory of the Darwesh Khel Waziris. The column was under the command of Lieut.-Colonel A. C. Batten, 2nd Punjab Cavalry, and was composed of :—

Two Guns No. 4 Hazara Mountain Battery under Lieut. A. Thorp, R.A.
One Squadron 2nd Punjab Cavalry.
300 Rifles 2nd Sikhs.
200 Rifles 1st Punjab Infantry.

It was paraded without warning at 10 p.m. on Sunday, the 5th February, 1899, at Bannu and marched off. A detour was purposely made from the direct route leading from Bannu to Gumatti border levy post which was reached at 2 a.m., but the real difficulties only began here, for the further route lay through an unknown defile. Two parties, each 100 strong, of the 1st Punjab Infantry, were sent ahead to move fast, and by passing the village right and left in the dark to gain the further side. A narrow rocky defile with precipitous sides, through which runs a stream in shallows and deep pools, is not the easiest road for a mixed force on a dark night, but by sunrise the village of Gumatti in an open and stony valley was reached and surrounded; the surprise was complete, and the birds were all at home. Diplomacy was tried, the Political officers and their assistants carrying on a palaver without effect until 9.30 a.m.

The village was small, and entirely hidden amongst trees; only two towers on the east side could be partly seen—these are built on solid bases of stones and mud fifteen feet square and ten feet high, and rise to some forty feet, containing two rooms—the only entrance is a small door reached by a rope ladder fifteen feet long. The walls are strongly built of rough tree trunks, mud, and stones, an effective shelter against bullets; and well-placed loopholes allow a heavy fire on any enemies. One tower was surrounded by a nine foot wall—here the outlaws, about seventeen men, had taken shelter, and shots fell irregularly—one Pathan with a Lee-Metford was shooting well.

The guns from a mound opened fire at 9-30 a.m., and hammered the towers at 900 to 950 yards for an hour—unsatisfactory work as the effect could not be judged owing to the screen of trees. Then the cavalry swept through the village, and the Infantry attacked with the bayonet, taking a few prisoners, but being brought to a standstill at the towers, were withdrawn with a loss of some six killed and wounded. Lieutenant Thorp was ordered to bring up one gun to make an effective breach at close quarters, and came into action at 100 yards, whence he riddled the towers pretty thoroughly. It is fairly certain that they were untenanted and untenable at the time, for he happily had no casualties, though fighting in the open. There was probably an underground passage or chamber.

At 12.15 p.m. the "Retire" sounded—the men had been under arms 14½ hours, they had no food with them, and four miles of a defile had to be passed in the short winter afternoon. The guns and cavalry ahead suffered little, but the Infantry had a hot time till Gumatti post and open country were reached. Owing to the precipitous nature of the sides of the defile, proper flanking and retiring movements could not be carried out, and the men were getting weary. Many a country *budmash* and young blood had come at the sound of fighting, and joyfully sniped from every point of vantage. The rear-guard of 1st Punjab Infantry had plenty of work replying by slow independent fire, and the dead and wounded were with difficulty brought along; by 3 p.m. they gained the open country, and a few minutes later only a man or two on a distant ridge was visible of their enemies. Nine outlaws and seventeen villagers were prisoners; but the tale on our side was serious: two British officers wounded, one Native officer of the 1st Punjab Infantry killed, and eighteen rank and file killed and wounded. The gunners had no man or animal hit. The chief outlaws too had escaped.

It was clear that a second visit and a good supply of gun-powder were necessary, and on the 9th February a force 1,000 strong marched out. The pass was picqueted, and passed through by day without opposition. The village was found empty, and was set on fire, and the offending towers blown up. The Gunners here again had peculiar work, for the Miner's fuze failing to act on the charge in one tower, Lieutenant Thorp endeavoured to explode it by firing ring shell at it and was successful after one or two trial shots had been fired.

The first affiair at Gumatti was a severe lesson in frontier fighting, and much can be learnt from it. If an unknown and difficult pass has to be travelled through, strong advanced and flanking parties must be sent ahead two hours before the main column to clear the heights and hold them. Gun-powder or dynamite must be carried; as every village contains these towers, where a few desperate men can defy good troops. Ring shell will riddle a tower, but certainly cannot bring it down. Percussion Shrapnel, the chief part of the ammunition of a 2·5″ R.M.L. gun, are of little use against mud and stone well built. The less time spent in parleys with men who know they will be hanged if caught, the better.

MANILA UNDER THE AMERICANS.

— BY —

CAPTAIN C. B. SIMONDS, R.A.

ON 26th January, 1899, I left Hong Kong on board H.M.S. *Centurion* on ten days leave for Manila. To be sent to the *Ultima Thule* of the British Empire [Wei Hai Wei hardly yet exists] falls to the lot of many officers, but to get a chance of a trip to the Philippines and back at such an interesting era in the history of those islands, on board the flag-ship and to be comfortably berthed in the Admiral's spare cabin, is at least fortunate provided the all-important question of leave can be arranged—here again fortune smiled on me as I got back on the day on which my leave expired. As regards the officers of the *Centurion,* I knew what to expect. From the Flag-Captain downwards I had got to know most of them very well through the medium of polo, cricket, racquets, and other games and I never wish to meet a nicer lot of fellows; the Commander was an old friend of mine, whom I had known when quartered at Bermuda, and it was to his kind invitation that I was indebted for a most pleasant ten days leave. We left Hong Kong at 9 a.m. on the 26th and had not got far outside the Lye-Mun when we found ourselves in a heavy beam sea, the North-east Monsoon, which always blows at this time of year, was asserting its presence rather severely. The ship went very steadily in spite of the fact that we did a four hours full speed trial and a twenty hours trial at fifteen-and-a-half knots the second day. By 5 a.m. on the 28th the wind and sea had gone down considerably and on looking out I could just see land as day was breaking on our port beam, my first glimpse of the Philippines.

Arrive in Manila Bay.

At 10·45 a.m., on 28th January, steaming slowly, we entered the channel between Corregidor and the main land of Luzon. Shortly after 11 a.m. we were in Manila Bay heading for Cavité. A straight cut terrace, overgrown with grass, showed where the Spanish guns on Corregidor had probably been—as far as one could judge from the ship it looked like a reverse battery which could only fire on ships after they had passed through the channel; there did not appear to have been any other fortifications, had there been they must have been skilfully hidden; a red-cross flag flying over some buildings on the island showed that they were being used as a hospital. We anchored off Cavité about 1.30 p.m. before which the customary salutes had been exchanged between the *Centurion* and *Olympia*, Admiral Dewey's flag-ship. After the Admirals had exchanged calls Admiral Dewey came to take Sir Edward Seymour round the wrecks of the Spanish Fleet, and at 4 o'clock some twenty of us went off in uniform to visit Cavité.

Summary of events since 1896.

Before describing what we saw, it may, perhaps, be desirable to give a brief summary of the events which have occurred since 1896 for the benefit of any readers who have not followed the fortunes of the Philippines closely within the last twelve months.

Prior to 1896 cases of insurrection among the Filipinos against the Spanish rule had occurred, but had always been quelled with promptitude before assuming serious proportions; there is little doubt that the Filipinos had just cause for complaint—it was the story of the Inquisition over again. Encouraged by the success of the Cuban Rebellion, some of the more influential Filipinos in the neighbourhood of Manila organized a body of agents, all energetic young men, and sent them into the various districts to find out if the natives were willing to rise. One of these agents was Aguinaldo, whose district happened to be Cavité, he not only found the people willing to rise but too eager, and they forced his hand by starting the rebellion before plans had been properly matured. This rebellion may be said to date from 26th August, 1896. Round Manila the rebellion was practically quashed at the start, and resulted only in a few natives being shot down. Aguinaldo found time to take up an entrenched position at Novaletta, and here the Spanish brought a most dire disaster on themselves; when advancing against Aguinaldo's position they moved in three columns along the isthmus from San Roque, one column along either beach and one along the road in the centre. On either side of the road at one place were paddy fields, in which a few rebels with rifles were in ambush; on the approach of the columns these rebels opened fire on them, a panic among the Spanish was the immediate result, the inner column turned outwards and the outer ones inwards and began firing into each other. Officers could not control their men and the result was that they shot each other to the number of some six or eight hundred without doing any practical damage to the rebels. After this, Aguinaldo, finding that the insurrection in other quarters had failed, retreated with a few followers into the interior, glad to get off with his life. He had, however, made a name for himself through this chance occurrence and was regarded by the Spanish authorities as the leader of the rebellion. The Spanish Governor of the Philippines then negotiated with the Spanish Home Government for authority to expend two million dollars to pay Aguinaldo and other leading rebels to leave the Philippines and thus put an end to the rebellion. Aguinaldo received $400,000 and agreed to leave; he went over to Hong Kong and later on to Singapore. Thus ended the insurrection, and the Filipinos settled down again under Spanish rule. This was the state of affairs when the Spanish-American war broke out in April, 1898.

Novaletta.

On Sunday, 1st May, 1898, Dewey's squadron entered Manila Bay, and on that day destroyed the Spanish Fleet at Cavité. His orders, originally, had been to destroy the Spanish Fleet and leave, but, finding he was short of coal, he was obliged to remain awaiting supplies from colliers; in the meantime Brother Johnathan began to develope a taste for annexation of territory which ended in the American squadron remaining and troops being sent over from America to occupy and drive out the Spanish. It was considered too that the Filipinos might ably assist in expelling the Spanish and that Aguinaldo might be a useful man. Aguinaldo was negotiated with and very soon Aguinaldo returned. Backed up by the Americans, he had great influence among the Filipinos, especially when the Americans gave him arms and ammunition to distribute among them. In a short time Manila was invested by the combined American and Filipino forces, and eventually on the 13th August the Spanish surrendered to the American troops on condition that they were to be allowed to retain their arms and that the Filipinos were not to be allowed to plunder the city. The American troops then took possession of the city and immediately guarded all approaches and prevented the Filipino troops from entering at all. This action the Filipinos resented very warmly, hoping at least to enjoy joint occupation with the Americans, and they at once assumed an offensive attitude towards the new comer. In a very short time the American troops found themselves besieged in Manila in much the same position that the Spanish had been, and this was the state of affairs that existed at the end of January, 1899, the time of which I write.

Cavité.

To return to my personal experiences:—at the east of Manila Bay is situated the capital and some six miles south-west of this is the long narrow peninsula of San Roque, from which runs out to the eastward the peninsula of Cavité joined to that of San Roque by a narrow causeway. Having landed at the Arsenal, situated at the eastern end of Cavité, N——— and I decided to explore together and made up our minds to have a look at the Arsenal on our way back to the boat. We soon found our way outside and came across some squads of American soldiers drilling while others were engaged at a game of base ball; as a shower of rain came on we took shelter in the verandah of a barrack room; we were soon surrounded by a bevy of occupants who turned out to be Tennessee Volunteers. On enquiry, we found that the garrison of Cavité consisted of two regiments of volunteers, in all some 2,000 men armed with Springfield rifles. Up to the time I write all the volunteers sent from America to the Philippines were armed with this weapon, which seems to date back to some time between our Snider and Martini-Henry, it is an improvement on the former, on much the same principle, opening longitudinally with the barrel instead of across; carries a ·457 bullet, the cartridge is solid drawn and of white metal; each man carries 100 cartridges in bandoliers round his waist belt; to admit of this number being carried they are double banked. The uniform consisted of a stout blue cotton shirt with breast pockets, breeches and gaiters a mixture of red and green of coarser texture (the material one uses in India for shikar purposes), as regards boots there seemed to be a variety—probably most of them had either worn theirs

Springfield Rifle.

out or were saving them—a brown felt hat, which to my mind, hardly looked thick enough to keep out a tropical sun in hot weather.

San Roque. The rain having stopped, we took a vehicle of the country which we found outside the Arsenal, and after going about half a mile over an atrocious road, found ourselves on the causeway leading over to San Roque—this causeway was neutral ground between the American and Filipino lines. The Insurgent sentries, probably recognising us as British officers, did not seem to object to our passing, so we drove round the village of San Roque—the type of a Filipino village—if one disregards the unsettled appearance of the place due to the large number of armed Insurgents billetted there. The village looked neat and tidy, houses built on piles, the frame-work chiefly bamboo and thatched with leaves of nipa-palm, each house surrounded by its little garden planted with vegetables and hedged with bamboo and banana palms, and here and there a tall cocoa-nut palm. After driving round the village, we re-crossed the neutral causeway and paid off our Jehu, deciding to return on foot after our recollections of the road.

The Defences of Cavité. An accommodating American sentry allowed us to pass through a sally port which led up to the ramparts facing the causeway, and here for the first time we had an opportunity of examining the Spanish preparations for defence when the war with America broke out, the guns having been left untouched since the American occupation. In the cavalier at the south-west corner were three guns facing south :—The first, a bronze gun, hexagonal bore, about the size of our 32-pr. S.B. Still loaded and spiked—it could never have been fired without breaking up the carriage on which it was mounted. The second, a S.B. gun of much the same size supported in a carriage, the breast of which was too narrow to admit of the trunnions going down into the trunnion-holes, the breech was propped up on scraps of fire-wood, this too was loaded and could never have been fired. The third, a similar gun to No. 2, was mounted on a more suitable carriage, but the slide, of iron, was probably intended for a 7″ or 9″ gun—this gun was not loaded and *might* have been fired during the battle of 1st May! On the western face of this cavalier the Americans had placed a 1″ Gatling machine gun to command the neutral causeway, an ideal place for a Maxim, but hardly for a gun throwing a 1″ bullet.

From this place we could form a very fair idea of Cavité and its surroundings; the western half of the peninsula had been a fortified rectangle about half a mile long and a quarter broad, surrounding a native village where probably the Arsenal employees lived; the eastern half, irregular in shape, was taken up by the Arsenal and Dockyard. N——— and I decided to return to the Arsenal along the southern face, a straight wall with the sea coming right up to it—the wrecks of four Spanish war vessels lay off this shore—I suppose these attracted us; we were glad when we had reached the far end of that wall, some 800 yards long. We were afforded an opportunity of seeing the sanitary arrangements made for the 2,000 troops and probably 1,000 Filipinos living in Cavité. Sanitary arrangements! Well, they were practically nil, and what will happen when the hot weather sets in one did not like to contemplate. If Hercules wished to repeat his feat with the Augean stables here was an opportunity! On the north side of the Arsenal we found some ten or twelve casemates which were all empty and in a dilapidated state; each had an embrasure, but they were so narrow that no gun could have possibly fired over an arc of more than 15°.

Spanish ships.

Off this shore lay the *Reina Christina* with one funnel standing, the other nearly fallen, and two other sunken ships. Two small cruisers, the *Isla de Cuba* and *Isla de Luzon* had been previously raised and sent to Hong Kong for repairs. I had seen these ships in Hong Kong when they first came over and had carefully examined them, but could not find any trace on either which would lead me to suppose they had been sunk by gun fire. It seemed to me odd that no attempt had been made by the Americans to save any of the guns on board the sunken Spanish ships during the long months that the American Fleet had been lying idle in the harbour, since 1st May, 1898, the day of the battle of Cavité; it would have given the crews employment and practical experience in shifts under varied conditions. A few guns had been saved and were lying in the Dockyard, but these were all off the ships that had been floated; these guns had been painted over with red lead on the outside, but nothing had been done to clean or save the bores or breeches from further rust. From what I saw none of the guns of the still sunken ships appeared to have been damaged by fire, though some of the mountings had lost their shape, but this was probably the result of heating when the ships caught fire. With the exception of some twelve 4·7″ guns which had been taken off the *Isla de Cuba* and *Isla de Luzon,* we saw no modern B.L. guns of any description in the Arsenal, they were nearly all bronze and cast iron smooth bores; the mountings too were of the same obsolete description, so that the armament of Cavité could at no time have been formidable. We found no traces of any other guns having been put up for the land defence of Cavité by the Spaniards, the Americans must have either removed them or none had existed.

We returned to the *Centurion* at 6·30 just as it was getting dark and the musquitos troublesome. This was all we saw of Cavité as the ship went over to Manila the following morning.

Manila.

By 8 a.m. on Sunday, 29th January, we anchored about two miles off Manila. I went ashore at 9.30 in the pinnace and landed on the right bank of the Pasig river about half a mile from its mouth. Finding a conveyance of the country at the landing stage, I told the driver to go to the English Club, but the man could not understand me, so I dismissed him and decided to find my way about on foot. I eventually found my way to the English Club at Ermita, where I hoped to find some men whom I had met at Hong Kong and in Japan, who had taken their families away when the troubles began. In a very few moments I had been made an honorary member and was flooded by questions as to the cause of the visit of the flagship, an event on which the residents had formed all sorts of varied conjectures, many of which questions I did not attempt to answer. I eventually lunched at the same table with two of the older residents, who interested me very much with their views of the present situation and their accounts of how it came about, and thanks to the experience of these two men, I gained a very fair basis whereon to form my own opinions during the next few days.

Manila, the capital and chief port of the Philippines, is situated at the mouth of the Pasig river. Formerly this term was confined to the walled city, but now embraces the suburbs, the chief of which are Binondo, where the large business houses are; St. Miguel, the most fashionable residences; Ermita and Malaté. On the outskirts are the Filipino suburbs of Tondo, Pandacan and Paco, the houses of which are mostly constructed on piles with bamboo framework, the roof and walls being thatched with the leaf of the nipa-palm. In the accompanying map, the blocks containing permanent buildings are shaded round the edge, with a blank space left in the centre, while the Filipino suburbs and villages are shaded throughout with diagonal strokes of a different type; and what appears like scarping round the outskirts of the town shows roughly where the line of under-growth and jungle commences, open only where the roads intersect and portions of cultivated land happen to be.

The Walled City.

After lunch, I decided to pay a visit to the Walled City, as it seemed to be an object of interest. The Walled City is situated almost at the mouth of the Pasig river, on the left bank, built probably early in the 18th century, its battlements have grown black with age and give it a very sombre appearance; it is entirely surrounded by a moat, on the south and east sides there are two moats, bridged in two places. At the north-west corner of the Walled City are the Arsenal and fort of St. Jago; to my surprise I was permitted to visit both these places. On approaching the Arsenal, I was stopped by a sentry, but after sending my card in to the officer on guard, I found him most civil. He showed me round the workshops (which were out of work, it being Sunday) gun-parks, ammunition and rifle stores, both American and Spanish. Here were 40,000 Mauser rifles belonging to the Spanish troops which, by the conditions of surrender, were to be returned with them when they are conveyed back to Spain. There were still some 3,000 Spanish troops in Manila Walled City awaiting transport; these were sent into the Arsenal every-day to oil and clean their rifles and were only allowed outside the Walled City at certain times and within certain limits. Here were revolving barrel machine guns 1½″ calibre, with limbers packed full of ammunition—they had never been taken out of the Arsenal—also two 4·7″ (about) Krupp guns on overbank carriages. I was told they had been used by the Spanish at Fort Malaté, where the only fighting seems to have taken place. These were the only Spanish guns I saw that had been adequately mounted. There was also a large number of bronze and cast iron mountain guns of obsolete types, mostly smooth bores. Not the least interesting thing I saw was a pile of improvised artillery, manufactured by the Insurgents and captured by the Spanish in the early days of the Rebellion, guns made out of iron pipes with wood jackets in strips, held together by wrought iron hoops, others made of iron pipes bound round with telegraph wire; some of these were still loaded and had wooden or metal blocks closing the breech end, others which were not loaded appeared to have had their breech end blown out on being fired, thereby possibly doing as much damage to friend as to foe. The mounting for these guns was nearly in every case an iron fork with a spike handle which was presumably dug into the ground. There were also some small brass cast guns about 2″ calibre and weighing from 80 to 100 lbs.

Fort St. Jago. After looking round the Arsenal, the officer of the 23rd Texas took me into the fort of St. Jago, where the regiment was quartered. The fort is separated from the city by a moat ; it is reached by a draw-bridge, on the far side of which is a sally port. If report be true, this fort can boast many gruesome tales, rivalling even the stories of the Inquisition period. One of quite recent date is almost on a par with that of the Black Hole of Calcutta. Shortly after the outbreak of the Rebellion in 1896, some 120 so-called rebels were placed in one of the dungeons for a night; during the night the tide rose, partially flooded the floor and blocked out all ventilation, and in the morning some sixty were found dead from suffocation. This was not the work of a debauched young Nabob, but of an educated European supposed to be civilized. At the time I visited this place its sole occupant was a Spanish murderer, who had been placed there at his own request. I suppose the poor devil hoped to be suffocated thinking it preferable to having to wait to be hanged. I was glad to leave this cheerless spot.

Krag-Jorgensen Rifle. On my way out of the fort I was shown the Krag-Jörgensen rifle with which the American regular troops are armed; this rifle is very similar to our Lee-Metford, calibre ·305, bolt action, magazine with side feed containing five rounds, short bayonet, cartridge solid drawn with nickel coated bullet; the cartridges (100) are carried double-banked in bandolier round waist-belt.

Outside the Arsenal, on the west front, is a ravelin on the flag-staff of which the American flag was first hoisted in Manila on 13th August, 1898, and where it now flies. Round the crest of this ravelin are arranged twenty-two S.B. brass guns bearing the date 1855; these are now used as a saluting battery. Inside the Walled City are some fine buildings, among them some eight or ten churches, most of which are at present used as barracks for the 3,000 Spanish soldiers awaiting passage back to Spain. The sea front of the Walled City is now occupied by docks in process of construction, but since the war broke out nearly all work has been suspended.

After leaving the Walled City I returned to the Club along the Lunetta sea front, passing a redoubt (marked by a black spot on the map) in which were two Krupp guns, about 9″ or 10″ calibre; whether either of these had been fired by the Spanish I was unable to discover. At the Club I met several officers of the *Centurion*, and we all returned to the ship together at 6·30 p.m.

The outposts. During the next two days most of my time was occupied in visiting the outpost lines. An order had been issued on board ship that no officers were to go beyond the American outpost line unless accompanied by a resident; I took this order to apply to myself also. I first procured a map of Manila and its surroundings, I also tried to obtain some photographs of the place and incidents of the war, but could get nothing, everything had been bought up.

On Monday, 30th, I lunched with a British resident, who lived some distance outside Manila, at a suburb called St. Ana: he drove me out to his house; it was an interesting drive because we drove out through the American lines into the Insurgents lines. He had a very comfortable house situated on the river, where his wife and family seemed to be quite happy and not the least anxious about themselves. A large force of Insurgents were quartered close at hand; the General occupied a house next door to their own. My host informed me that they were far less subjected to restrictions living among the Filipinos than the British subjects living in Manila. After lunch my host had to return to his office in Manila and I commenced my tour of the outposts south of the Pasig river to Malaté fort.

From the left bank of the Pasig river the American outpost line runs along the left bank of a small stream, fordable by infantry at almost any point on the outskirts of Pandacan and Paco. In the accompanying map the American outpost line is shown thus ··—··—··—·· and the Insurgent line thus ·—·—·—·—·. From Paco to Malaté fort the line follows the track of a country road. The Insurgent line runs along the right bank of the stream as far as Paco and from there skirts the edge of the wooded country. Picquet patrols are employed by both parties with strong supports at the roads running in and out of Manila; where these roads are far apart, block houses are used for the supports, these were erected originally by the Spanish and some of them are now in the hands of the Americans and others occupied by the Insurgents. Between Paco and Fort Malaté the Insurgents have put up look-out posts among the trees in the woods. About three-quarters of a mile out to sea from Fort Malaté the Monitor *Monadnoc* is anchored to protect this flank. The Insurgent left rests on an old iron hulk stranded on the beach, the hulk is occupied by supports. When I visited

Malaté Fort. Malaté fort I found an artillery subaltern in charge; he showed me round the work—a redoubt built of masonry about the same date as the Walled City, probably originally intended to command the approaches from the south. A rifle gallery runs round the south and west fronts, this is now a good deal damaged by the recent bombardment. The walls show faint signs of ancient scars

American field gun.

possibly inflicted by the English under General Draper in 1762. On the west face is a hole through the masonry parapet made probably by a 6″ or 8″ shell which burst just after penetrating and partially destroyed the roof of a building inside judging by the effect produced. In three other places are marks of shell from small Q.F.'s; these appear to be the only recent hits from seawards. On the south face two shell had penetrated the parapet, these had probably been fired from fixed guns on land, judging by the direction the shell had taken. On the south-east corner of this fort the Spanish had had two siege guns on over-bank carriages; the Americans had replaced these by two field guns of their own. As some of the Insurgents look-out places in trees, about 300 yards off, could see into the fort, these guns were covered with tarpaulins and I could only get a partial glimpse at one of them. It was a short gun about $3\frac{1}{2}''$ calibre, shell 16 lbs., charge $14\frac{1}{4}$ ounces, and smokeless powder. The gun had the same breech block as our 12-pr. B.L., interrupted screw, de Bange obturator, the only difference being that the carrier ring swung out to the left instead of the right. I was shown two shell, a shrapnel and a common; the shrapnel was of steel and had a time fuze screwed in, the fuze was very like our time and percussion, short both in shape and size, but the system of setting length was more like that employed with the old wooden time fuze, small holes were arranged and numbered spirally round the body of the fuze and length set by a hole being punched at the required place by means of a fuze key which worked rather on the principle of a leather punch. The common shell was of steel also, sharp pointed and had a base fuze. I was informed the base fuze worked most unsatisfactorily. Both shells had Vavaseur driving bands, the band was plain, neither bevelled nor canelured. A friction tube with a complicated spiral spring was used to fire the gun. I could detect no vent-sealing arrangement. As the gun was so much covered over and the officer showed some reluctance about exposing it, I was unable to discover any method of checking recoil and did not care to appear too inquisitive. The elevating gear was worked on the lazy tongs principle, it seemed rapid in movement and the gear itself was concealed in a trail box; there seemed to be practically no back lash (perhaps the gun had not fired many rounds); on the whole it seemed to be a good arrangement. In size the wheels seemed much the same as ours with about a five foot track.

On Tuesday, 31st, I visited the American outpost line from Tondo to Sta Mesa; here about a mile out to sea was the *Baltimore* anchored to support the flank. Running inland from the sea, the American outpost line runs along the southern end of a lagoon crossing the canal by a bridge and then circles round eastward. All the roads running in and out of Manila are patrolled for a quarter of a mile or so to keep touch with the Filipino outposts, whose outpost line skirts the edge of the wooded country. A mile or so out on the Malolos Road is a large Insurgent camp where there were said to be some 10,000 men encamped. The Americans had two guns and strong supports to guard the railway and Malolos Road. To eastward of the Hospital de Lazaro my map was unfortunately embellished with an elaborate design, significant of the fact that it was a map of Manila and suburbs, so my sketch is in consequence wanting in detail, but as there are no very striking natural features until one reaches the neighbourhood of Sta Mesa, I have not attempted to fill in the vacuum. The guns of the crack Utah Battery were distributed along this portion of the line. The country round Manila is generally very flat and low-lying, but at Sta Mesa is a ridge where the Nebraska Regiment was encamped; this ridge appeared to be a fine healthy spot for a camp and certainly had other advantages, being in the centre of the American line of defence and close to the main water supply for Manila, the water pipes running along the bottom of it; but to the eastward, across a tributary of the Pasig river, the close-country and houses in possession of the Insurgents were so adjacent that a small force of riflemen scattered in the woods would render the camp untenable. At a small bridge north-east of Sta Mesa where the road crosses the tributary, an American sentry is posted at one end and a Filipino sentry at the other. I was informed that frequent cases of wordy quarrels had occurred between the sentries at this bridge, but the American guards had strict orders not to bring about a row. I was shown all over the Sta Mesa camp by the Colonel of the Regiment. The men had ample accommodation, two to three men in a tent in which we would put two officers in a hill campaign in India; the mens tents were all small, about the size of our 80 lb. Kabul tent, which forms part of an officers equipment in India. The camp in consequence took up a lot of room, and I was surprised to find only one regiment, 1,000 strong, encamped on the ridge. The men were extremely well fed, all groceries, tinned provisions, etc., being imported from America and vegetables from China ports. The camp bakery supplied excellent bread, the flour being imported from America; the ovens, however, would be hardly sufficiently portable for a moving camp. The men of this regiment were of splendid physique and certainly looked very well, I was informed that they had had practically no sickness.

The Situation in January, 1899.

At this time there were in all some 20,000 American troops at Manila divided into five brigades; four brigades were told off to portions of the lines of defence and one to the Walled City. General Otis was at this time in command of the whole of the land forces.

Among the whole of the troops I could only discover two batteries of Field Artillery, these were split up into sections along the various portions of the defence and none were horsed. Some Coast Artillerymen had been sent over from California but few were employed as such, they mostly took their tour of duty with the Infantry. A small portion of cavalry had also been sent over, but these were employed for orderly work only, and mounted on Manila ponies. No horses had apparently been sent from America. Against this, the Filipinos had no artillery, but they had over a dozen Maxim machine guns and a large number of Remington rifles and ammunition for the same which had been issued to them by the Americans whom they assisted against the Spanish. The Americans have occupied Manila for nearly six months and have not gained a step since they entered. The Filipinos have increased in numbers round Manila and attribute inactivity on the part of the Americans to fear; they now number from 60 to 80,000 in the neighbourhood of the capital; these are not an armed mob, but fairly well drilled troops, properly paid, clothed and fed by a Government which Aguinaldo has established at Malolos with himself as President. Aguinaldo does not apparently intend to attack Manila unless his hand is forced, but he intends to resist any attempt on the part of the American troops to extend their influence beyond their present lines. At Iloilo the Americans have not yet succeeded in gaining a footing so that their occupation of the Philippines is confined to Manila and Cavité.

Filipino view of the Situation.

The bulk of the Filipinos being uneducated can only view the new-comers from what they have actually seen and from what has actually occurred. The Americans required their assistance to capture Manila and this done they now feel that they have been thrown over and are mistrusted. They have been allowed no voice in any matter concerning the future government of the country; they can see no improvements nor reforms; their churches are used as barracks; they allege that their customs and stamp duties have been seized; they accuse the Americans of avarice, think their manners are over-bearing, and almost wish themselves back again under Spanish rule.

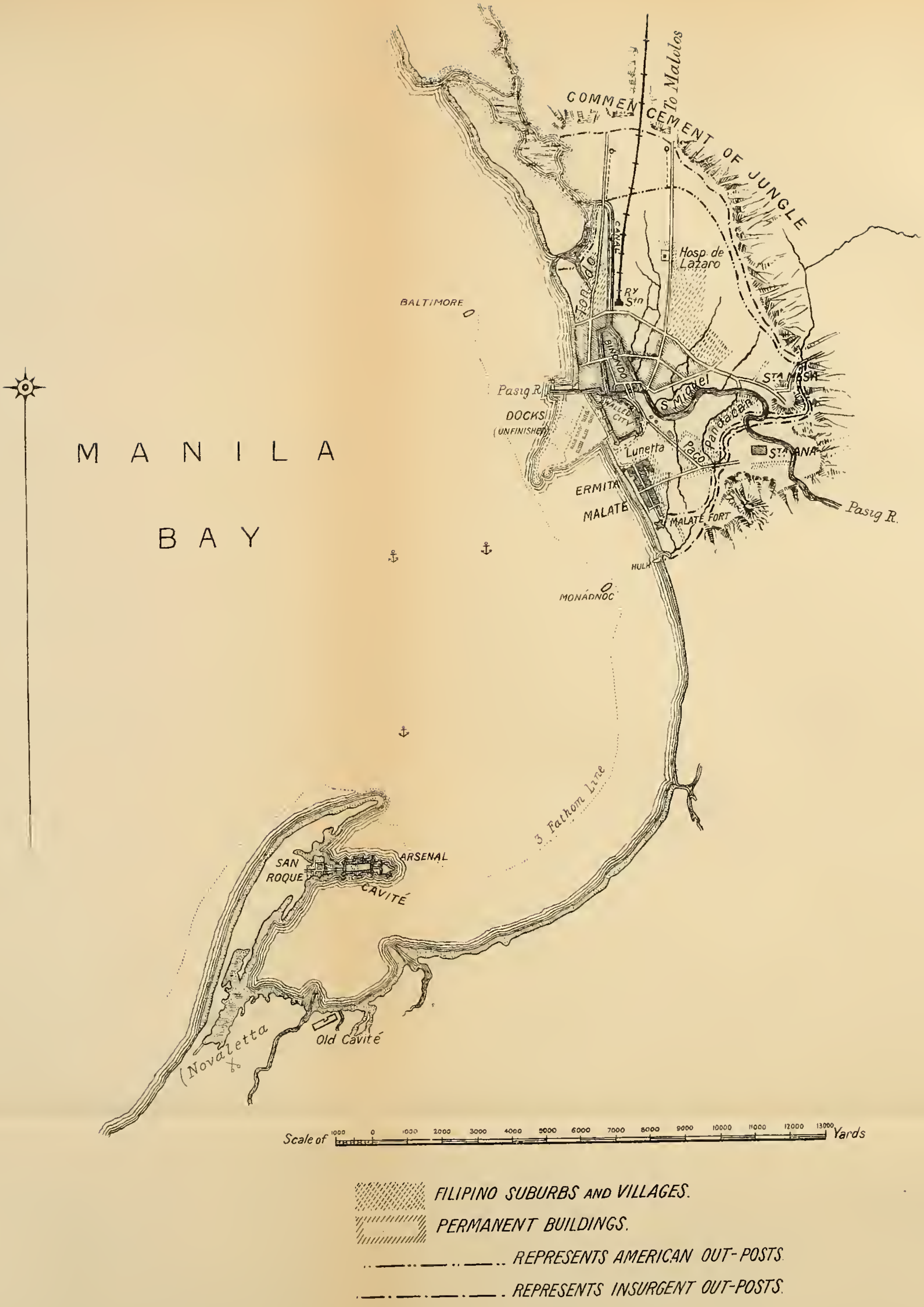
American policy.

Be this as it may, it will not be disputed that the Americans have made mistakes, and as colonisers they have a lot to learn. Had they even consulted some of the older European inhabitants of Manila, or had they entrusted Aguinaldo and other prominent leaders with a certain amount of power, and instituted some form of joint Government under an American Governor, it is more than probable that the Filipinos would have given up their arms, come to terms, and eventually settled down in contentment. By now the city, roads and churches might have been placed in a state of repair and a colonial army system started, instead of which the rebels were probably never more roused than now, the whole country is up, and they are daily seeing a beautiful city dropping into a worse state of decay, which they not unnaturally attribute to the work of the new invader.

The Americans have had a difficult task before them and their chief difficulties have been caused by their inexperience as colonisers, at the same time they have, in many respects, done remarkably well. Their troops, a large number of which are volunteers, have been kept well in hand, and a high standard of discipline (though in many ways at variance with our system) has been maintained, for which every credit is due to them. Every unarmed Filipino enjoys the same privileges as any other inhabitant and is left unmolested.

Unfortunately the Filipinos cannot be made to understand that the future policy of the Americans as regards the Philippines has to be considered by a Board not yet assembled and submitted to Congress for approval before any decision can be arrived at; the delay incurred may embolden the Filipinos to attack, the result of which will render the American situation more difficult still. Should such a thing happen, great loss of life must result and probably great damage to property ensue. Owing to the inflamatory nature of the outlying villages, incendiarism will probably play an important part.

In writing the above remarks it may be thought that I have given my views with great confidence, considering that my knowledge of Manila extended over a period of three days; in defence, I can only plead that I saw nearly everything that was to be seen at the time, and it was my fortune to make the acquaintance of several people on whose opinions and experiences I could place reliance.



MANILA
BAY
COMMENCEMENT OF JUNGLE
To Malolos
Hosp. de Lazaro
RY Stn
Tondo
CANAL
BINONDO
S. Miguel
STA MESA
Pandacan
Paco
STA ANA
WALLED CITY
Lunetta
ERMITA
MALATE
MALATE FORT
Pasig R.
Pasig R.
DOCKS (UNFINISHED)
BALTIMORE
MONADNOC
HULK
3 Fathom Line
SAN ROQUE
ARSENAL
CAVITÉ
Old Cavité
(Novaletta
Scale of 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 Yards
FILIPINO SUBURBS AND VILLAGES.
PERMANENT BUILDINGS.
REPRESENTS AMERICAN OUT-POSTS.
REPRESENTS INSURGENT OUT-POSTS.

ARTILLERY FEATURES OF THE NAVAL BATTLE OF SANTIAGO DE CUBA.

— BY —

CAPTAIN C. ORDE BROWNE, *late* R.A.

Lecturer on armour plates at Ordnance College, Woolwich.

(*A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday, 16th March, 1899*).

Colonel J. R. J. Jocelyn, Commandant Ordnance College, in the Chair.

THE Chairman:—I will now ask Captain Orde Browne to kindly deliver his lecture.

Captain Orde Browne, *late* R.A.:—Colonel Jocelyn and gentlemen; the title of this paper will, I hope, show that my main object to-day is to deal with the action of the Spanish and American ships, so far as light is thrown on questions which concern coast batteries. If this, however, has drawn me on to touch on matters which rather concern the Navy, it may lead to a more animated discussion than if I take a rigid line, and on this account I venture to speak on points on which it would, perhaps, be wiser to be silent if my object were to suggest nothing that I could not certainly make good. The same wish for a discussion also leads me to be as brief as possible.

The Spanish cruisers, under Admiral Cervera, entered Santiago Harbour, on May 19th, 1898. By May 29th the United States fleet had commenced a blockade in full strength, that is with nearly their entire fleet of efficient armour-clads. The Spanish attempted to break out on the morning of July 3rd. I would only notice a few points connected with the period of blockade. The American ships were unable to anchor and therefore kept their position under low steam power, which is better and more economically performed by uncoupling the forward engines; this, however, entails the alternatives of either losing a quarter of an hour to couple up, or else of running at about three-quarters speed. The fires were banked in a peculiar way, which caused a great expenditure of fuel, but secured rapid attainment of full heat when desired.

The American ships at first took a position in a semicircle round the mouth of the harbour, each vessel being at about six miles from Fort Morro. The armoured ships lay in the following order, taken from west to east, (see Diagram *):—*Brooklyn* (cruiser) *Texas, Massachusetts, Iowa* and *Oregon* (battle-ships) and *New York* (cruiser). The semicircle on the extreme west was completed by the *Vixen* and *Marblehead* and on the east by the *Porter, New Orleans* and *Mayflower,* unarmoured. The principle incidents were (1) occasional firing with no marked result; (2) the running in and sinking of the *Merrimac* on June 3rd, in the mouth of the harbour, in order to block it. This was most gallantly performed, but the vessel so sank that the passage was not obstructed; (3) the systematic lighting of the harbour entrance by the battle-ships *Iowa, Oregon* and *Massachusetts,* standing in for two hours in turn and taking a position at about 3,000 yards distance from which they were able to illuminate the entrance very satisfactorily.

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* Taken from United States Official Plan in the Report of the Chief of the Bureau of Navigation.

About June 10th the ships closed in their semicircle to one of about three miles radius, and this seems to have been further decreased later on. The garrison of Santiago could fire but little because their armament was miserable. Two 16 cm. Hontoria B.L. guns appear to have been the most efficient weapons they possessed. This must account for the immunity enjoyed by the sentry ships illuminating the harbour from a fixed spot at 3,000 yards range, night after night.

One or two things deserve mention from their inefficiency. The Spanish appear to have had submarine mines placed, one of which was "picked up by the *Marblehead's* screw," and another "dislodged by the *Texas.*" Admiral Sampson considers that these ships had "narrow escapes." The mines in question were charged with gun-cotton, but the fuzes were actually defective. Some inside the harbour, however, were in fair condition. On the other hand, the *Vesuvius* fired her enormous torpedo shells "almost nightly," and Admiral Sampson observes that "no doubt that the explosion of shells of this character has a very important effect." The Spanish (see Lieut. José Müllery Tejeiro's report) observe that "if the projectiles dropped close to a battery its ruin was certain. Fortunately they do not seem to be very sure either in range or in aim." As it does not appear that any projectile ever fell even "close to any battery," the value of the dynamite gun is questionable.

In the Siege of Sebastopol some of our sailors sunk a gun in a pit at 45° elevation. An officer, seeing it, send its shot far over everything, asked where it went, and received the reply, "somewhere into Rooshia." Russia is a very large target. Probably the dynamite gun at present must be put under something under the same category as the sailors gun. It is very effectual for firing "somewhere into Rooshia."

Admiral Cervera's squadron consisted of four cruisers. Of these, three belted cruisers, (see Diagram) *Maria Teresa, Vizcaya* and *Oquendo* were all similar except that the *Vizcaya* appears to have had ten 5·5-inch Q.F. guns, and the others only ordinary pieces. The fourth cruiser, the *Colon,* was of a new and an entirely different type. She had never received her primary guns (two 10-inch pieces) but she had ten 6-in. Q.F. and six 4·7 Q.F. guns, besides smaller pieces, and she was plated with 6-inch Harveyed steel armour over her belt and the main part of her upper structure. With the cruisers were two torpedo-boat destroyers, *Furor* and *Pluton.* All the Spanish ships were supposed to have a speed of full twenty knots, but the three older cruisers had bottoms in very bad order. Of the American armoured ships, only the two cruisers had greater nominal speed than the Spanish ships, namely from twenty-one to twenty-two knots. None of the battle-ships reached eighteen knots.

Clearly, it was specially needful that the Spanish ships should coal and, if possible, attend to their bottoms during their forty-four days imprisonment. Complete cleaning needs a dry dock, which did not exist. A fair cleaning may be done by divers; probably these were not forthcoming. There remains, however, something to be done by working from boats and dragging lines round under the ships. When a difference of a single knot may determine success, this surely should have been attempted, but it does not appear to have been thought of for no expression of regret at its non-performance is found.

On the morning of July 3rd, 1898, the Spanish cruisers broke out. The task was supremely dangerous, and the Spanish officers regarded it as desperate. Hopeless, however, it certainly was not, and at the moment some circumstances favoured the attempt. The entrance of the harbour was deep, though a long vessel must move slowly to get through safely. Once clear, it was necessary to run the gauntlet of the fire of such ships as might be prompt enough to get within range. Then would follow a chase. The Spanish ships ought to have the advantage of getting up steam first, and the United States vessels had half their engines uncoupled. On the morning of the 3rd the *New York*, Admiral Sampson's flagship, had moved off seven miles to the east and the *Massachusetts'* place had been temporarily taken by the *Indiana*. The Diagram shows how the ships lay. They had rather drifted during the night towards the south-east, the western end of the line being, as usual, filled by the *Brooklyn*, cruiser. Admiral Cervera's plan was to break through at this west end of the line, and then run west. By this means it might be hoped that the only vessel dealt with at close quarters would be the Brooklyn, for the others might not be ready enough to close instantly, and unless they did so they could effect but little, for their speed ought to be inferior to that of the Spanish cruisers. The Spanish ships in passing, were all to deliver their fire into the *Brooklyn*, so as to cripple her, if possible. By this means, there was a fair hope of escape, at all events for the time. So far I should judge that most naval officers would concur with Admiral Cervera, but I should think no further.* The Admiral himself led in the *Maria Teresa* and meant to take the brunt of the firing. The *Vizcaya* came second and was, if possible, to ram the *Brooklyn*. This is open to most serious objections. It would be a very sanguine man who would expect the *Vizcaya* to escape after ramming the *Brooklyn*, though no doubt the latter ship would cease to be a danger to the remaining Spanish vessels.

Moreover, this selection of the vessels for their appointed tasks was singularly unfortunate. A ship possessing Q.F. guns should have been chosen to perform the firing and prepare the way, if possible, for the others. As noticed hereafter, the *Colon* should surely have been selected on the ground of her armour and her Q.F. guns; but apart from the question of protection, it showed a want of appreciation of the power of quick-fire to direct the *Maria Teresa* with her miserably small energy (see Diagram) to undertake the fire, and the *Vizcaya* to ram and thus to lose the opportunity of using her Q.F. broadside guns.

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* This paper deals only with the actual operations attempted, that is breaking out by day. The question of the better chances offered by a night attempt is not entered upon.

At 9.35 a.m. the Spanish vessels came out in the following order:—*Maria Teresa, Vizcaya, Colon* and *Oquendo,* followed by the two destroyers. The Americans showed extraordinary promptness in closing on the mouth of the harbour, so that the battle-ships *Texas, Iowa, Oregon* and *Indiana,* all brought their fire to bear. An analysis of the results of the fire shows that the percentage of hits was very small. We could surely expect nothing else. The call was sudden, and unless a hit could be made speedily the enemy would be out of range, and as the only vessel of either fleet using smokeless powder was the *Colon,* it is easy to see that smoke would shroud the ships to a great extent, as indeed is actually reported. In about eight minutes from the time when the smoke was first seen to be moving towards the mouth of the harbour, the United States ships had advanced and opened fire. The general direction was north-west, but the *Brooklyn* went about turning her head east, and then south to west, to avoid ramming, discharging her port broadside, and then running parallel to the Spanish ships and using her starboard guns against them. The *Gloucester* moved south and then turned after the destroyers, closing and hotly attacking them. The fire of the battle-ships (although they were practically deficient of all Q.F. guns, except very light ones) aided by the *Brooklyn* and *Gloucester,* sank the *Furor,* caused the *Pluton* destroyer, to run on shore, set on fire the *Teresa* and *Oquendo,* and swept down their men so that they turned inshore at about six-and-half and seven miles respectively from the harbour mouth. The *Vizcaya* ran nearly twenty miles and then turned inshore, burning hopelessly. The artillery interest centres in the part played by the *Colon.* She ran past the *Vizcaya* on the shore side, and thus escaped some of the American fire.* She gained a lead of four or five miles, then her speed failed, and the *Brooklyn* (though running with her forward engines uncoupled) and the *Oregon* overtook her so far as to bring her under fire. The *Texas* and *New York* were following, and the captain ran ashore and surrendered.

The Spanish fire hardly injured the American ships. How came it that the *Brooklyn* did not suffer at all when the Spanish ships succumbed so immediately to the American fire? The answer is that the fire was very badly directed. The official drawing of the *Brooklyn* (see Diagram) shows about twenty-five hits of some kind on funnels, deck structures, cranes, and turrets above the freeboard, and about twelve hits below. If we bear in mind that the ship presents a solid target below the upper edge of the freeboard, and the funnels, cranes, and even turrets are only incidental spots above this line, we see that the Spanish fire of considerable volume must have poured over the *Brooklyn,* but all directed too high to be of use, although the Spanish probably stood well to their guns. The Spanish cruisers were riddled and burnt out, except the *Colon,* which was uninjured practically.

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* It may be questioned if the *Colon* without previous arrangement would have been justified in running between the *Brooklyn* and *Vizcaya,* both firing hard and both using smoke giving powder and Q.F. guns.

I do not like to offer strictures on the part played by gallant men, who came out to what they felt to be hopeless destruction, but while it is clearly understood that we respect their courage and devotion, we must criticise their operations in order to learn what lessons we can from any faults they committed.

To deal then first with the *Colon.* We must all sympathize with the captain of the *Colon.* It must have been very disheartening to go to sea for active service with his principal guns deficient. His eye would constantly see the turrets, and he would be borne down by the sense that they were "hollow mockeries." He might feel that he was a sort of impostor, who could bark but who could not bite properly. If the thought that his ship was more modern than her consorts in her Q.F. armament and armour came to him, he might almost stamp with vexation when he looked at his empty turrets, and thus he might never sit down and work out the actual powers of his crippled ship. If this were so, we cannot have a better practical illustration of the need of carefully working out the powers of ships of war, for I fully believe that even thus crippled, the *Colon* was so well suited for the particular work before her, that I doubt if ten better ships could be found in all the world. Her task was first to bear the attack of a volume of shell fire in emerging from the harbour; second to pour in shell fire on the *Brooklyn* ; third, to out-speed the American ships and escape. The *Colon* possessed (1) actual speed to escape, for she proved it by the lead she acquired ; (2) the power to resist all the fire of the United States vessels, except that of the primary guns, and even those could only get dead metal into her in most places ; (3) she had a quick-firing battery which ought to have crippled the *Brooklyn* in a few minutes. Under these conditions, she allowed herself to be overtaken, and she surrendered while uninjured herself, and without having injured her enemies. Can we have a more convincing illustration of the need of weighing our own powers with those of our known antagonist and of fighting skilfully ? Although the *Colon* ran past the ship ahead of her on the shore side and escaped some fire, yet the portion of her open to inspection as she lay nearly submerged, shows a fair share of hits, and among which is one of a 5-in. projectile, which was defeated, as must be the case, by her 6-in. Harveyed armour. This round must have been from the *Brooklyn,* who alone carried 5-in. guns. After attaining a lead of four, or, perhaps, five miles, why did her stoking fail ? Lastly, why did she not endeavour to make more fight before surrendering ? The natural answer may be that it was useless loss of life; but we must remember that while fully honouring this motive, it is not always easy to say whether loss of life at the moment may not save life in future. Cromwell is taxed with cruelty in his wholesale slaughter at Wexford of those who had scuttled a hulk full of prisoners whom they drowned like rats at his approach, but in 1798 the recollection of this saved the lives of a number of Protestants in Wexford, who were drawn out and being massacred till the murderers were stopped by being reminded of Cromwell's action. Humanity has abolished capital punishment in Switzerland, but this was not humanity to the Empress of Austria; and a captain of a ship might surely well feel that the expectation that a Spanish captain would fight so long as he could do so to substantial purpose, would help future Spanish ships, and we believe that the 6-in. quick-firing guns of the *Colon* ought to have knocked the upper structure of the *Brooklyn* to pieces at a rate that would have made a captain who knew this, feel that it was right to try, even though he might be captured immediately afterwards. The *Brooklyn*'s 8-in. slow-fire guns, moreover, were the only ones capable of penetrating the *Colon's* armour, and there is some reason to think that she fired only common shell, which would have been kept out altogether by her armour.

Speaking as I say, to draw out discussion, I should urge that Cervera should have made his fighting with the *Colon*. The deficiency of her primary guns, outrageous as it was, only prevented her making belt attack and still left her by far the most powerful ship in speed and in defensive powers, and formidable in fire energy. I suggest that all combustible material should have been removed from unarmoured parts. Some powder to make smoke and prevent recognition in emerging from the harbour should have been issued to her to use from small guns and she should have led the way, closely with the *Brooklyn*, and poured in her quick-fire till the other cruisers passed her, thus screened at all events from the *Brooklyn's* fire. This seems to me the plan offering the best hope of escape. In the light of accomplished facts, I mean especially the prompt action of the United States ships, it may be doubted if the *Teresa*, *Vizcaya*, or *Oquendo* would have by any means escaped, but it seems as if the *Colon* herself might have done so, especially if she had not hugged the shore, and at all events it would have been something to have crippled the *Brooklyn* and this, I believe, she could have done certainly.

To turn to the American fleet achievements. The special feature was surely the promptness with which the vessels got into motion and into action. With regard to the individual American ships, the *Oregon* seems to have excited most admiration, and in the way of speed to have done more than was expected. Unfortunately, the part played by the *Brooklyn* appears to have been magnified by correspondents; or, at all events, so described as to have caused offence. However this may be, it seems impossible to escape from the conclusion that she was so placed that she had the opportunity of playing the most prominent part, and that she did it, and, so far as we can see, did it well. The official diagrams show that while she was naturally the least protected of the ships engaged she received most fire. The analysis of hits made from the official records in the *Scientific American* of September 10th shows that she scored most hits.* The largest total of hits made by guns above 6-pr., is that of 5-in. projectiles, and these were only carried by the *Brooklyn*, and were delivered on all four Spanish ships. There is strong reason to credit her with a large share of the 8-in., and, if so, of other calibres, but the 5-in. record speaks positively for itself. On the *Brooklyn* alone was a man struck (viz. one killed and one wounded)) and she naturally led the chase. Surely justice compels us to say that the ship which led the chase was under the hottest fire, was selected as the target, and was meant to be rammed, and which apparently scored most hits on the enemy, was the vessel that was favoured by circumstances to take the most prominent part in the battle.

In closing, I would ask whether we have not reason to congratulate our Navy that we have not yielded to the cry of a complete thick water line belt at the cost of continuous protection on the upper structure. This applies to battle-ships and cruisers alike. In "Brassey's Annual" for 1897, I instanced the *Charlemagne*, launched in 1895, as a ship open to destruction in every form by common 6-in. shells and liable to be reduced to the condition of a floating ruin, and the *Kaiser Friedrich III* class, the first of which was launched in 1897, are in no better case. The contrast of the *Colon* with her consorts ought to impress upon us the desirability of recognising ships. The attack by heavy armour-piercers, which was needed for the *Colon*, would have injured the other Spanish cruisers little indeed compared with shell fire. Undoubtedly the latter is the attack to make in case of doubt, and is generally the best, but the existence of ships with their upper structures covered with 6-in. Harveyed plates, a class likely to come in now, shows the desirability of identifying an enemy and of attacking with discrimination.

**Official Table of Hits made on the Spanish Cruisers at Santiago showing the Number of United States Guns Firing on them.*

(*From the "Scientific American.*")

Nature of United States projectiles.	Number of hits on Spanish ships.					No. of United States guns.	Hits per gun.
	Teresa.	Oquendo.	Vizcaya.	Colon.	Total.		
6-pounder	17	43	13	4	77	42	1·83
1in.	2	—	—	—	2	13	0·15
4in.	1	7	4	—	12	3	4·0
5in.	3	3	7	2	15	6	2·5
6in.	1	1	—	1	3	7	0·43
8in.	3	3	5	1	12	18	0·67
12in.	2	—	—	—	2	6	0·33
13in.	—	—	—	—	—	8	0·00
	29	57	29	8	123	103	

It may be questioned if even the American officers fully appreciated the difference between the *Colon* and her consorts. This is the more remarkable as Admiral Sampson is a high authority on armour. Let us read his order of battle on May 22nd. It contains the following paragraph:—"While the *Vizcaya, Maria Teresa* and *Oquendo* have "strong protection on barbettes and water line, they have no protection "elsewhere, and are vulnerable to even 6-prs. Fire should be concentrated on the centre part of these ships just above the water line. "In case of the *Cristobal Colon,* her belt and barbette armour is inferior "to that of the other ships, but her protection elsewhere extends over "a larger area. None of this armour is face hardened."

Surely this is rather a hint than a distinct order as to the different attacks required. My idea would have been something like this. "Be sure to distinguish the *Colon,* who is covered with hard faced 6-in. "armour, which can only be perforated by A.P. projectiles from guns of "8-in. and larger calibres. The other cruisers have heavy belts only "and may be easily destroyed by shell attack."

In former times in battles in the field, matters were left to chance to a great extent which gradually have been brought down to calculation. Many of the elements thus dealt with are beset with uncertainty, yet it would be ruinous not to deal with them as far as is feasible. Nevertheless in the present day there are those who think it unpractical to deal with the fixed and known elements of ships armour and guns, and here we have ships lying inside and outside a harbour and growing weary of doing nothing week after week, with information doubtless in their hands which would guide them, yet we are compelled to question if even all the fundamental elements of success were clearly grasped by the gunnery officers of either fleet. We see a ship, the *Colon,* so situated that a brilliant part was open to her and the opportunity was altogether unperceived, an opportunity which might have made the fate of Santiago a different story.

DISCUSSION.

By direction of the Chairman the Secretary read a letter from Colonel Sir George S. Clarke, K.C.M.G., R.E., Superintendent of the Royal Carriage Factory, Woolwich, regretting his unavoidable absence and offering the following remarks on the lecture, a précis of which had been sent to him beforehand:—

Sir George Clarke, K.C.M.G.:—There are a few points on which I do not quite agree with Captain Orde Browne. It must be remembered that Admiral Cervera left Santiago only on receiving position orders from Marshal Blanco, under whom he had been, most unwisely, placed by the Spanish Government. Cervera knew the state of his fleet, and was under no illusions. From the first, he had warned his Government that he was going across the Atlantic to court certain destruction. "With an easy conscience," he wrote from St. Vincent, "I go to the sacrifice; but I cannot understand the decision of the Navy general officers against my opinions." On June 24th when he was being urged by Marshal Blanco to escape, he telegraphed "You will decide whether we are to go further to the sacrifice, which I consider useless."

In the state in which the squadron found itself on July 3rd, I do not think it mattered what ship lead the column. There was no reasonable chance of ramming any American ship, and the *Vizcaya's* attempt, if it was an attempt, did not go beyond a temporary swerve out of column. The only question for the Spaniards was whether they could draw clear before being disabled and maintain their speed. The *Colon* would have been able to reach Havana if she had been able to keep up another knot and a half. As it was she averaged only 13·7 knots and was unable to maintain 15 knots.

Again, I do not think the *Colon* would have had any chance in a single action with the *Brooklyn*. The armaments were :—

Colon..................	10–6-in. Q.F. and 6–4·7-in. Q.F.
Brooklyn	8–8-in. B.L. and 12–5-in. Q.F.

The disparity in Q.F. is not great and we knew that the *Colon's* gunners were quite untrained, whereas the *Brooklyn's* men were in excellent form and highly practised. Neither the *Colon's* small superiority of armament nor her side armour would have availed her. It is the man behind the gun that counts now as always.

For these reasons I do not think that the Santiago action is "an example of the decisive results that may follow the neglect to recognize fundamental differences in character between ships." A superior fleet in good order with well trained gunners destroyed an inferior fleet in thoroughly bad condition, and with untrained gunners. I do not see that any recognition of differences in character of ships could possibly have made any difference in the result.

Lastly, I think that to discriminate between "belt attack" and "shell attack" is a refinement too great for practical purposes. To hit an enemy's ship anywhere is as much as the naval gunners can hope for. The Americans were probably as well trained gunners as any afloat. They had an exceptional amount of practice. They were not themselves subject to any disturbing effect from the enemy's fire. Yet we find that on the large targets offered by the Spanish cruisers, only the following hits were scored, viz :—

13-in.	47	rounds	nil.
12-in.	39	,,	2
8-in.	219	,,	12
6-in.	271	,,	3
5-in. Q.F.	473	,,	15

With these figures before us, I believe that it is hopeless to expect to carry on a "belt attack." It is also worth noticing that in percentage of hits the 12-in. and 8-in. guns easily beat the 5-in. Q.F. The naval gunner has a legitimate cause for pride if he hits his enemy's ship anywhere and cannot hope to select individual areas to attack.

Lieutenant H. CHAMBERLAIN, late Royal Navy:—Colonel Jocelyn and gentlemen. I open the discussion with an apology for doing so being a retired officer, but I still take a great interest in naval questions. The first point that struck me as regards affairs at Santiago is, should the Admiral have been under the orders of a military officer on shore? I have just been reading Lord Lyons' life, and I believe that in the Crimea Lord Lyons was not under the orders of Lord Raglan. In other words, the naval portion of his business was left to him, and Lord Raglan managed military operations. In the French service at that time Canrobert and Pelissier both had Bruat under their orders, and that helped to cripple our expedition against Kertch. That I look upon as the administrative defect of that campaign; and you will bear in mind that administration comes before efficient action, and it is defective administration which frequently leads to failure in war. Anybody who has read an extremely useful work, called "Naval Administrations," by Sir John Briggs, will agree with that view. The book is well worth reading if only to show that unless you have efficient administration you cannot expect efficient service. Pluck is of very little use in the front rank. It is of very good second rate quality: it is a quality possessed by nearly every nation under the sun, and therefore you may say it cancels itself all over the globe; but nearly everything hinges on administration. We now come to the subject which has been so ably dealt with; 'Firing on an enemy and attacking with discrimination.' I entirely agree with the lecturer. These people outside Santiago had weeks and weeks to think over a certain subject. If their Naval Intelligence Department was a good one they must have had plans of the Spanish ships, and they must have known exactly what each ship looked like, and must have known exactly what sort of firing was most detrimental to the ships with which they would probably have to engage. Therefore I think they should have attacked with discrimination. The observations made by that very able officer Sir George Clarke in his letter, would lead one to suppose that it is impossible to attack with discrimination, and that naval gunners ought to be too thankful if they can hit a hay stack half a mile off. But those who have seen naval gunnery, especially naval gunnery of the present day, will find that it is fairly good taking it all round, and that they are not only too thankful to hit the ship at all, but with a fair amount of care and due preparation they should be able to hit the superstructure or somewhere near the belt, which is not I think "a refinement too great to be hoped for." Then if ships escape in broad daylight they give the blockading squadron an opportunity of seeing the particular ships which are coming out towards them, and whatever induced Admiral Cervera with an unlimited command of pilots (who must have known every inch of the mouth of the harbour), to come out in broad daylight when he might have come out in the dark, passes my comprehension. I do not profess to be an up-to-date naval officer; but I have studied the American Civil war and blockading operations, and have given an immense amount of consideration to blockade work in theory. Did ever a merchant steamer, endeavouring to run the blockade in the 1861–64 war, wait until night was past in order to emerge from the harbour and run the chance of being thrashed outside by the United States cruisers? On the contrary the darkest night, the most unfavourable conditions for observations from the outside, were invariably selected. But Cervera appears to have gone to the very opposite extreme, and because he had received orders to escape he seems to have thought he should escape exactly at the hour mentioned. Naturally military operations are generally better conducted in the day time. I believe it is a maxim in land warfare never to attack at night unless you have a very highly trained army and a small range of country to traverse. At sea it is exactly the opposite. Always come out of harbour at night if you know your harbour well enough. Had I—had that thing been put upon my shoulders, first of all I should have come out at night, and in the second place I should have said as the odds are very much against my escaping at all, I will try and make the best of it by sacrificing one ship to engage and letting the others go off in two opposite directions, leaving the Americans outside absolutely in the dark as to which ship had gone in one direction and which ship had gone in the other. They would not have been able to discrimate between the class of ship which had gone east and the class of ship which had gone west, and they would not be able to send special ships after special ships, but would have been in the dark as to which direction was the best to concentrate their force upon. As the lecturer said a few minutes ago it was a question of minutes in which this decision had to be taken, and the Admiral's orders, mind you, had to be obtained: because ships cannot dash off east and west without an absolute order. Thus one wing might have escaped while the other wing might have been crushed; but at any rate there might have been the escape of one or two ships. It seems to me it was madness to come out in the daytime. Then as to the percentage of hits I believe it is extremely low. In 1884 I invented a game called 'Naval Blockade' a sort of maritime 'Kriegspiel' intended to demonstrate, amongst other things, the uncertainty of fire effect and how much it depended on chance. I believe in that game the percentage of hits which could be counted on worked out to 15 per. cent. One of the chances was whether the ships engaged by day or by night. It is a very difficult thing to judge distances by night and the manner in which electric search lights are used has an important bearing on both tactics and gunnery. On the question of the general principles of armament I have been in recent communication with the Admiralty Intelligence Department on the subject of the distribution of armour with reference to the Spanish ships and our own Navy and in this study I received valuable assistance from Colonel Porter but as he is present and is I understand going to join in the discussion I will say no more except that naval officers are always extremely obliged for the criticisms of military officers on naval subjects, and in my opinion they are often more valuable than the criticisms of naval officers themselves as the military man views the question from outside and lookers-on very often see the most of the game.

Major G. G. Aston, Royal Marine Artillery (Professor of Fortification at the Royal Naval College, Greenwich) :—Colonel Jocelyn and gentlemen; there is a certain point, I think which one ought to follow out in regard to this lecture. The main object in studying history is to get lessons that will last for all time for one's own guidance, and it seems to me that the great point is this question of identification. The lecturer referred humorously to the gunner in the Crimea who hit "Roosher," but experience has shown that that degree of accuracy in war time is extremely creditable. It is a great thing to be able to hit something belonging to the enemy. One writer with practical experience of the 1870 war, referred casually to the losses from the enemy's fire and the *far greater losses from the fire of friends.* In the case of coast defences, it is of the first importance to identify the nationality of approaching ships and to educate the coast gunner to this point is of national importance. The question is whether, under existing circumstances, we can expect more of him under the strain of war conditions. Can we expect him at long ranges to identify not only the nationality, but also the class of vessel approaching, so as to adopt different natures of attack to different classes? There are many here to-day who are far more competent to speak on this point than myself, and it would be of great value to get the opinion of an officer accustomed to the identification of foreign ships at sea, a late flag-lieutenant if possible, on this point; can we expect to identify not only the nationality but the actual class of a ship to such an extent as to be able to decide the nature of her protection, whether she has a belt or not, etc., before deciding what we shall load our guns with to attack her? That seems to me to be a point which, if we could arrive at it through this discussion, would represent something very practical for guidance and future use (applause).

Colonel Morton Porter late R.A. :—Colonel Jocelyn and gentlemen. The point I wish to speak upon is the question of armour and ships protection. The *Oquendo*, the first vessel of the Spanish fleet which was struck, being only belted and unprotected from the waist upwards, was pierced at once by a shell and her fire-hose was destroyed; a second entered the Admiral's cabin and she was burnt by fire. The *Vizcaya*, when she came out, gallantly tried to loose off a torpedo. She too was only belted below. The unfortunate officer was told to launch the torpedo in the face of no protection. I think if I had been him I should have cursed the man who designed such a vessel and the Admiralty who bought it, for it meant certain death. Immediately the gun cotton of the torpedo head was blown up; so it would be again. The third vessel still belted, like our belted cruisers might be—even our *Diadem*—that too was only belted and naked from the waist upwards. The American Admiral went on board afterwards and he picked up a paltry 1-pr. shell from this flag-ship, the *Infanta Maria Teresa* and even that paltry shell had penetrated her, and she too was lost by fire. It may be answered that the wooden parts of the vessels were the cause of their destruction by fire. But I would ask what the future will be with the quick-firing guns improved as they will be and made still more formable by bursting charges of melinite. I think it is madness for any country to send battle-ships out only with their vitals protected—only armoured from the belt downwards, only with a turtle deck and above that nothing. How different was the *Cristobal Colon!* As we have been told she was armoured *cap-a-pied*—from head to foot. Lieutenant Myers of the United States navy says in his report, a 5-in. shell would not enter her because of her armour. There was no fire there. If her officers wished to launch a torpedo they could have done so. She was covered with 6-inches of Harveyed steel, and yet the weight of armour she carried was no greater than the *Vizcaya* or the *Maria Teresa,* only the skilful designer had placed it where it was wanted; and what was the result? The few shots that told upon the *Brooklyn,* all came from her. I now go on to speak of England's enormous food carrying trade. One ton of meat per minute for instance being landed in this country. To protect this trade she has a fleet of 100 cruisers but it is no small matter to know that these are of the same type as the Spanish vessels which were destroyed, viz.: belted—their vitals protected, but, 'naked from the waist up.' A Naval officer told me they would never be able to come to terms with fast foreign cruisers who would give them the go-by and keep out of range of their guns. The *Diadem* herself under fire of 5-in. guns and picric shells would not live ten minutes. The solution of the problem is in my opinion to build large cruisers fully plated, such as the *Drake* class, combining the strength of Vulcan with the fleetness of Mercury; but there are only four of these provided for in our naval programme. There is great activity in foreign dockyards; other nations will see our weak point and will build large armour-plated cruisers which could not be touched by English battle-ships because they would not have the speed, nor by English cruisers because they they would not have the strength.

Commander Mark Kerr, Royal Navy:—Colonel Jocelyn and gentlemen, this is the first time I have ventured to speak in public, and it seems to me that I have had a sharp blow below the belt from Major Aston whose remarks about a Flag-Lieutenant were directed at me, for I have been four times in that position. There was one point out of many in the lecture in which I agreed with the lecturer thoroughly, and one point out of very few with which I disagree. The point in which I agree with him is, that even without her primary armament I would sooner be in the *Cristobal Colon* than the *Brooklyn* in a fight. I had the good fortune to meet many of the American officers who had been in the fight at Santiago de Cuba at New York shortly after their return, and I was most hospitably entertained by them on several occasions and took the oportunity of picking their brains as to their impressions of the fight and its lessons, and the information I gathered convinced me of what I had always thought before, of the vital importance of side armour to cruisers, just thick enough to take off the shot. The projectiles they told me, hardly ever hit point on, I think there there was only one that did—the greater number glanced off. The point I venture to disagree with the lecturer upon is this,—he said there were no divers on board the Spanish ships. I have had a good deal of experience of Spanish ships, and I have no doubt there were divers, but I am equally certain there was no diving apparatus, for that had no doubt been sold long ago. (Laughter). Then to go to the point which Major Aston mentioned, the difficulty of recognising ships at sea. In the Autumn manœuvres of 1886, going down Channel a signalman came up and reported to me that there was a ship on the starboard bow, and he thought it was a paddle steamer. We were looking very hard for the '*Archer.*' Now the '*Archer*' is as like a paddle steamer as a crow is like a hedgehog. We all looked at her very carefully and saw two funnels, and a paddle box. The Admiral said: "I know what that is, that is the *Vivid* taking the Commander-in-Chief to inspect the *Britannia* at Dartmouth." And we all thought it must be. One thing puzzled me and I said to the signalman "I can see no wash from the paddle boxes" He said "No more can I Sir." We did not like to say anything as we could not be sure, but afterwards we heard it was the *Archer.* She had built up dummy paddle boxes, and got up a canvas windsail for a second funnel, and she passed the whole of the fleet six miles off without being recognised (laughter). The next time we met our friend, was on the surrender of the enemy's fleet which was captured in the Thames. We saw, what we thought was a merchant ship leading the line, and we all said "What an extraordinary thing that a merchant ship should be steaming at the head of the fleet: why she is signalling, there must be a signalman on board" but it was the *Archer* again (laughter). Now that is no exaggeration at all; therefore you see how very hard it is for people to distinguish vessels at sea, even people who are always at it. At the night attack on Malta harbour I was standing on the top of the Palace with the Admiral and the General and their staffs. The forts were ordered to open fire on the *Benbow* or *Phaeton* when they were within 2000 yards. Well they turned the search lights on a merchant ship and and someone fired and then all the forts opened fire together on her which was exactly what might have been expected. Someone pulled the string and all the others chimed in. (Laughter). People who have been at it all their lives find it very hard to tell a ship until she is within two or three miles, and with a trifling disguise it is extremely difficult. There are certain matters, as for instance the way our ships carry their boats, the position of funnels which they cannot alter very well, and which after a good deal of experience you can distinguish through a disguise; but you have to have all these things not only at your finger ends but in your eye; so that I think in any scheme for recognising ships it will be necessary to have the assistance of an expert; that is to say a signalman who has left the service might be put in every fort to assist the officers in charge of the forts in recognising ships. Some of the remarks the American officers made afterwards may be of interest to some of you. First of all they deplored not having smokeless powder They were very full of that. They said if they had had smokeless powder they could have done a great deal more. Secondly, they said that the effect of the shell fire was so tremendous that they fired no armour-piercing projectiles. I do not think that more than two armour-piercing projectiles were fired at any ship except perhaps the *Colon.* There idea was, and all History bears it out, that all actions in the past have been won, not by sinking the platform, but by killing the men. There is not a single action on record, I believe,—I have not been able to find one—where the ship that was taken had not lost the greater number of men. The successful actions resulted from the greatest killing, and constantly it has happened that the ship that was beaten was in a better state of preservation at the end of the action than the ship that had taken her. In our fights the enemy generally fired at our masts and rigging to try and disable our ships, while we used to fire at the hull and kill the men. It has been the same in the wars of all foreign countries. The victor has killed the vanquished. This points to the great value of shells. Of course in an action it is extremely difficult to distingnish one ship from another, but the rule that I always give men under me when I have charge of a battery is:—fire at the base of the foremost funnel of a battle-ship or armoured cruiser and the base of the funnel of an unarmoured cruiser—because there it is likely to do the greatest amount of damage. It possibly will cut the connections from the conning tower and burst in the battery or perhaps in the joints of the hydraulic pipes of the fore-turret in the case of the battle-ships and armoured cruisers, and in the unarmoured ship the engine room hatch is generally just abaft the after funnel, and that is where you are likely to do the most damage. Of course you can give orders to certain ships that, if possible, they are to fire armour-piercing projectiles at enemies ships covered with armour but generally the shell is most valuable as it is the thing that kills. I do not think I have anything more to say. I expect I have said too much already, but I must thank the lecturer for his interesting paper (applause).

The CHAIRMAN :—Before I call upon Captain Orde Browne to reply, there was one question which it was hoped a naval officer would answer; I do not think Commander Mark Kerr has dealt with it. The question was this. Supposing one ship can recognise another, can you get sufficient accuracy out of your firing when you are on board ship to make peculiar use of that knowledge?

Commander KERR :—I had stopped talking because I thought probably other people were as tired of listening to me as I was of talking, and there are senior officers here of much greater experience than myself on the subject. I asked this very question of the Americans—what they did? could they fire at certain places? They said, no, it was impossible; that all they could expect their men to do was to fire when their sights came on but they could not distinguish one place from the other. I asked several officers this question, and they all said the same thing. When a man goes to shoot at a target, if you tell him to fire at a point five feet high, he is perfectly calm, and he stands there at the end of the battery and says "yes sir; yes sir;" but as the ship is always moving do you think he cares two straws as to the exact point to be aimed at? He pulls his trigger directly he sees his sight on, and I am perfectly certain that in an action, when men's nerves are strung up more than at other times, they would do exactly the same thing. With regard to the letter from Sir Geroge Clarke which was read it did not occur to me that the gallant officer implied any disrespect to naval gunners in the remarks he made because I think it is what every naval officer knows, in his innermost heart, that, with a ship moving, the gunner will fire directly he sees his sight is on. With regard to the Spanish ships firing so high, as the lecturer pointed out, I think that arose in this way. When the Spanish began firing they were firing at 3,000 yards but when they were within 1,400 yards their guns were still sighted as for 3,000 yards. They forget to reduce their elevation, but one thing they did not forget, and that was to drink their coffee, because the cups were found empty on the tables down below (laughter and applause).

Commander B. CURREY, Royal Navy :—Colonel Jocelyn and gentlemen: I do not think you can fire at any individual part of the ship. It is very difficult to lay a gun on any particular spot, especially from low casemates. Then as to armour I think the question resolves itself more into whether you should put armour on to the ship, or have an armour deck only, and that of course depends upon whether naval constructors can build ships in that way. It is well known that the French ships which are armoured with a complete belt have not the same stability that our ships have and this is very apparent if the ship is damaged. Also it is known that you must have ships of greater size—greater tonnage to be able to carry the additional armour and maintain the other features. That is a very important matter for the naval architect and in a rough way presents some of his difficulties. Undoubtedly naval officers would much prefer ships which are sufficiently armoured to keep out all quick-firing guns. If this can be done then we shall be delighted. I think Colonel Porter is working in the right direction for that, and I think if he is successful in it we shall have some very good cruisers. If foreigners can do it we ought to be able to do it too (applause).

The CHAIRMAN:—Lieutenant Chamberlain opened his remarks by saying that the Spainards should not have come out of the harbour of Santiago by day, and he laid down certain rules. I understand that he would like—I presume from some brother naval officer—a criticism on the statement. Will any naval officer favour us with his views upon that?

Commander KERR:—If you come out of a port wanting to run away you would naturally rather not be seen and shot at. That is a truism if the only object is to run away; but why on earth the Americans tried to shut the Spaniards in Santiago, and why the Spaniards tried to get out is a thing I dont understand, because as long as Cervera was inside, Santiago could not fall. That is not merely my humble opinion, but it is the opinion of the American officers who were there. The American troops had been there months and months, and they could not get in while the Spanish fleet was there and in a very short time longer they would have to leave on account of sickness. So the funny thing is that the Americans who wanted Cervera out should have shut him in, and that Cervera who wanted to stay in should have come out (laughter).

Major A. D. SETON, Forfar and Kincardine Artillery Militia:—Colonel Jocelyn and gentlemen: I speak with regard to the question of projectiles and armour—a subject which I have studied closely. We want to keep out the largest number of projectiles, but how far can we go in the thickness of armour? With quick-firing guns we seem to have come back to the state we were in at the time of the bombardment of Sebastopol when nearly every ship that went into action was set on fire by shells. At Sinope the Turkish ships were all destroyed, and all through the war, every ship that was subjected to heavy shell fire suffered severely. The result of these experiences was the introduction of floating armoured batteries. Following them came *La Gloire* built by the French, and other early armour-clads which were practically armoured all over. In those days all the armament was what we now call secondary armament. Then the weight of the guns was increased and then the thickness of the armour, alternately, like a game of 'beggar my neighbour,' till the limit was reached in the 111-ton gun and ships of the *Inflexible* type. In the action between the *Huascar* and the *Shah* and *Amethyst*, the first ship was only armoured at the extremities with some 2-inches of soft iron but 90 per. cent. of the shell glanced off her, or burst outside, shewing the great value of even this feeble protection. It should be determined by experiment where the mean lies in the balance between guns and armour. The maxinum gun to consider would be one of 6 or 8 inches which appears to be the limit of the calibre of quick-firing guns. Dead metal need not be considered; but the shells must be. With quick-firing guns there will be an enormous number of shell fired of small calibre. The moral effect of shell bursting between decks is terrific. In one of the disputes between Chili and Peru a few years ago, a shell got into the battery of the *Almiralte Cochrane* and, exploding, also blew up a charge of powder that was coming up to one of the guns; it did a great deal of mischief and frightened the gun crews so that they ran up on deck and some jumped overboard (laughter). The French have developed the idea of extensive protection by a large area of thin side armour to a great degree in one of their cruisers the *Dupuy de Lome*, which is completely sheathed in steel about 4½-inches thick. Of the great value of such protection in action we have before us a very instructive illustration in the manner in which the *Christobal Colon*, survived for so long, under the Americans fire which so speedily disabled the *Vizcaya*, *Oquendo* and other less well protected ships.

The CHAIRMAN:—I will now call upon Captain Orde Browne to kindly reply.

REPLY.

Captain ORDE BROWNE:—With regard to Sir George Clarke's letter, I have the highest opinion of Sir George Clarke's judgement, and I agree with the first part of the letter, though not with last. With regard to the ramming it was evident that the ship which had the ramming to do would certainly lose at the instant of ramming the best opportunity of delivering her fire. The selection of vessels for their tasks with a view to their powers certainly ought to be considered, and I do not believe for a moment that if Admiral Cervera had sat down and put into shape any such summary as is attempted in those tables he would have acted as he did. He selected the *Teresa* with very small fire energy to do the firing and the *Vizcaya* to waste her large broadside fire energy to do the ramming, and the *Colon* with a large amount of fire, and covered nearly all over with 6-in. hardened plates, did hardly anything, running past the *Vizcaya* on the shore side. Sir George Clarke seems to speak as if shells were available everywhere but if Sir George Clarke were here I would point out to him that there were only two weak patches on the *Colon*, the rest is covered with armour which, for any shell to get through if struck direct, is equivalent to 12-inches of iron, and at 30° is equal to 16-inches of iron. Then with regard to discrimination of attack I wrote a paper in "Brasseys Annual" of 1898 in which I dealt with the question of accuracy of firing in action; and I referred there to the feeling of despair that creeps over a man in having something complicated to do at a supreme moment. Now there is nothing more simple than the general rule which is given to fall back upon in all cases of doubt or difficulty, namely: aim at the hull, near the foremast with your principal guns with shell fire, and further direct some quick-firing guns on any deck structure near the funnel or foremast. The object of the first is to indicate the best place to attack in case of doubt—a place where shells may tell in most ships; and the object of the second is to keep the directing intelligence of the ship closed up in its conning tower if you do not hit it. No one can fail to recognise a mast or a funnel. It is most desirable to have a simple rule of that sort to fall back upon in case of doubt; but why limit yourself to the low standard that is fixed as attainable by the most stupid or the most nervous man or by a man acting under the most difficult circumstances? Surely there are conditions when it is possible to do better. I very strongly oppose the idea which I have heard expressed as the practical view, namely: that the moment people begin to fire at you you are turned into a sort of idiot. I do not think for a moment, that officers who have had actual experience under fire would admit this. May I point out that the small undefended space beneath the turret in some ships represents the size of the target that the Navy habitually fire at in annual practice. It is marked out on the side of the ship in a figure in the article referred to in "Brasseys Annual" for 1898. Surely then there are circumstances when you ought to do something better than hit the ship anywhere, especially in the case of coast defences, in which you have a fixed platform. The same thing applies to identification. We have all learned that despatch boats practice all sorts of disguises; but you do not mean to tell me that a thing like this model, viz.: the *Charlemagne* or *Hoche* is going to disguise itself. It is heavy armour clads that might come and attack forts, I do not mean a fort like those at Portsmouth, Dover or Gibraltar. It might happen to some poor coaling station, which, coals having attained a high figure in these days, might be attacked; and surely it is very desireable that the defenders should be able to recognise their enemy and attack her with discrimination.

With regard to the question of American accuracy of fire, the percentage of hits was, as has been said, very small in this case. I do not see how you could have conditions when it would be much less. There was everything to prompt speed and to cause excitement, and a long range. One vessel opened fire I think at 5,000 yards. The American ships were called upon very suddenly to attack, and the time to act in was remarkably short. I think that explains the imperfect hitting. Perkaps I ought to say a word with regard to these "rectangles of energy of fire." I do not know if I have made the Diagram shewing fighting elements of Spanish and American ships plain to you. The energy of fire of each particular round is multiplied by its rate per minute. That gives quick-firing guns their proper proportion; so with regard to slow-firing guns the heavy guns may fire three-quarters of a round per minute, and quick-firing guns in extreme cases ten rounds per minute. The total gives the size of the rectangle. I do not believe, of course, that it is very accurate. The rates I got from the *Excellent.* It does not depend on individual opinion. As far as it goes it is a matter of fact. These rectangles of energy of fire have been objected to by one very high authority. I certainly think it would be very mischievious if you pressed conclusions arrived at too far, but I do maintain, with all its faults, it gives you an idea of your power of fire in a general way. I do maintain that to know the weight of the blows you can deliver per minute is one important element of your fighting powers and the highest authority in the world would not persuade me to the contrary. I do not think I have much more to answer, because I think most speakers agree with me generally. The question was raised why the Spaniards did not escape at night. I do not think the reason they give is sufficient as far as I can judge, but it was that the sentinel ship threw an electric light so intolerable that they did not like to pass it. From what we have heard to-night we must conclude that they had much better have passed it, because it is very unlikely that the Americans would have been as ready by night as they were by day and the ships would quickly pass into darkness. In conclusion, I would say that I am very glad we have been able to get so many naval opinions expressed.

The CHAIRMAN :—Gentlemen, before we thank the lecturer, I would like in your name to thank the Naval Officers who have come here and helped us this afternoon (applause). We hope they will always form an important element in all artillery discussions of this nature. I now ask you to pass a vote of thanks to the lecturer for his extremely interesting lecture (applause).

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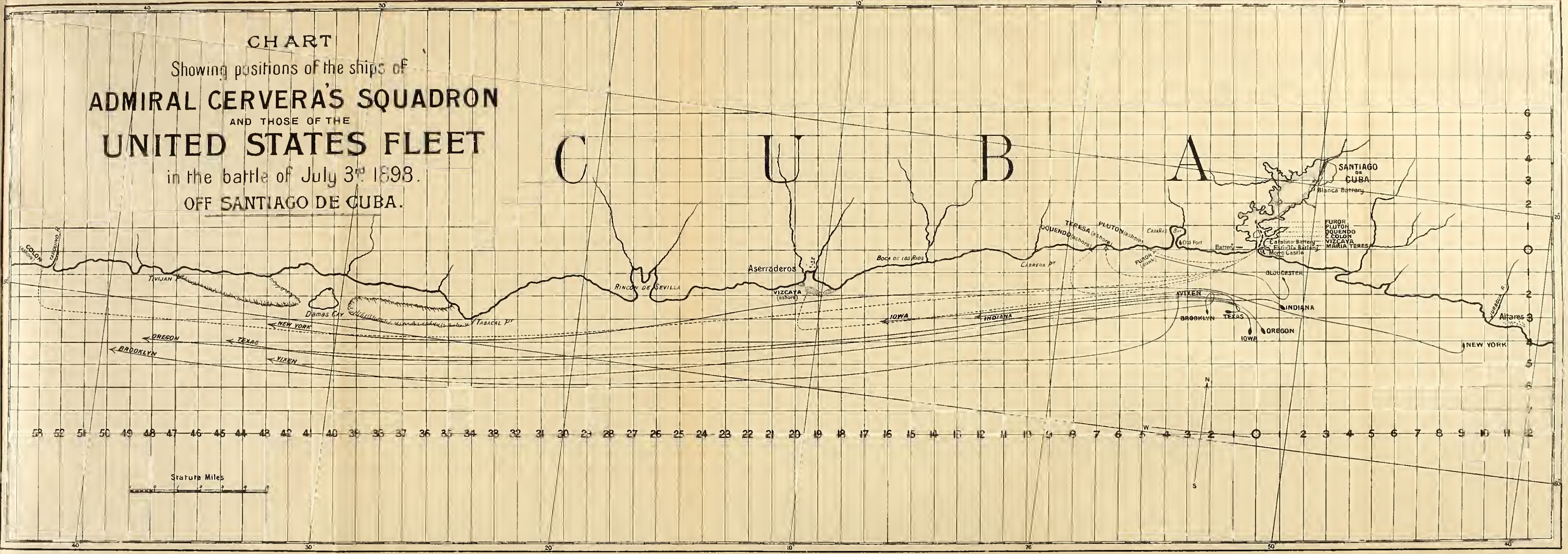


CHART

Showing positions of the ships of

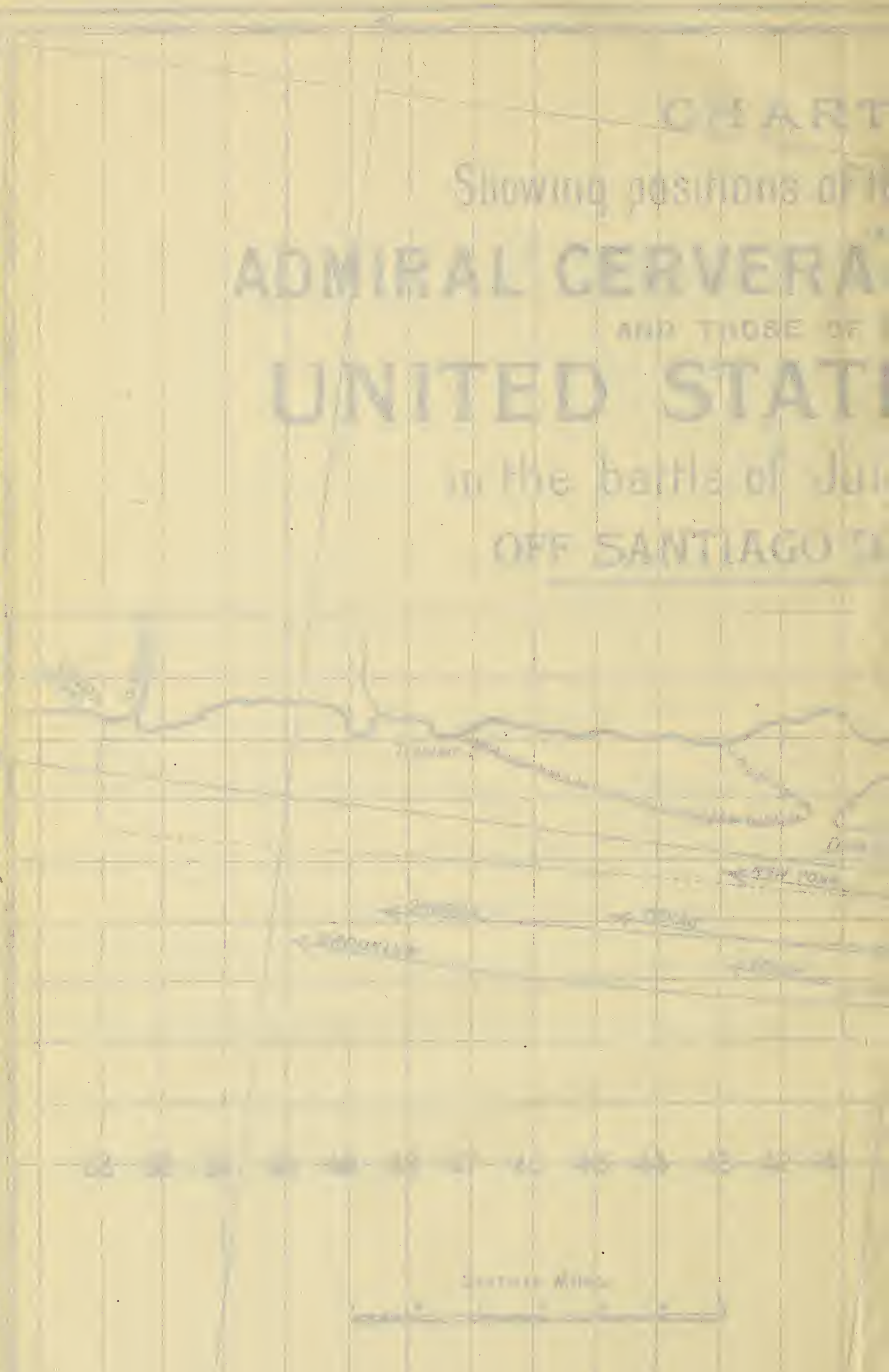
ADMIRAL CERVERA'S SQUADRON

AND THOSE OF THE

UNITED STATES FLEET

in the battle of July 3rd 1898.

OFF SANTIAGO DE CUBA.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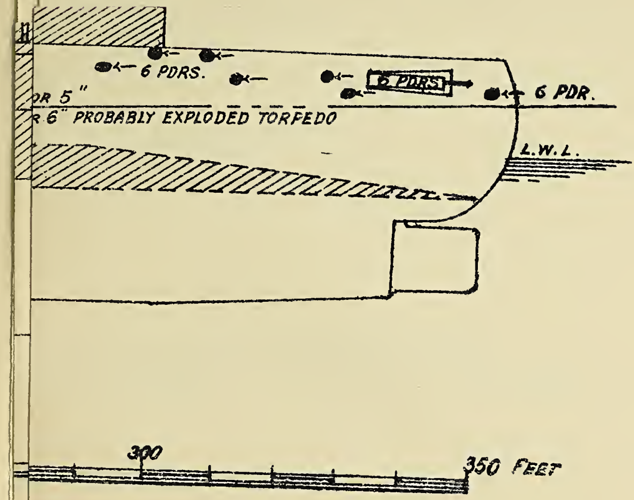
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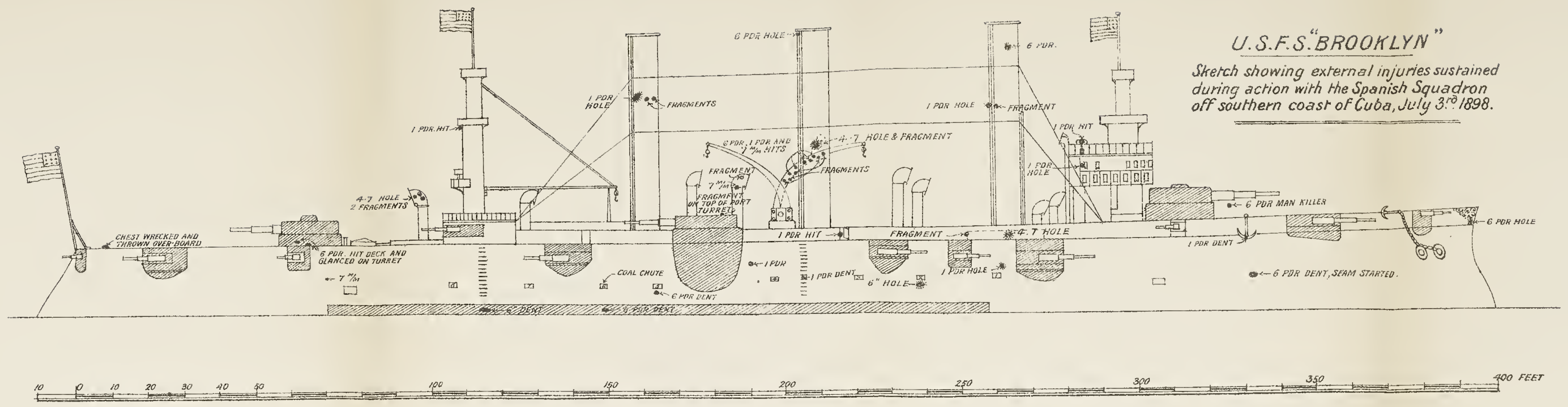
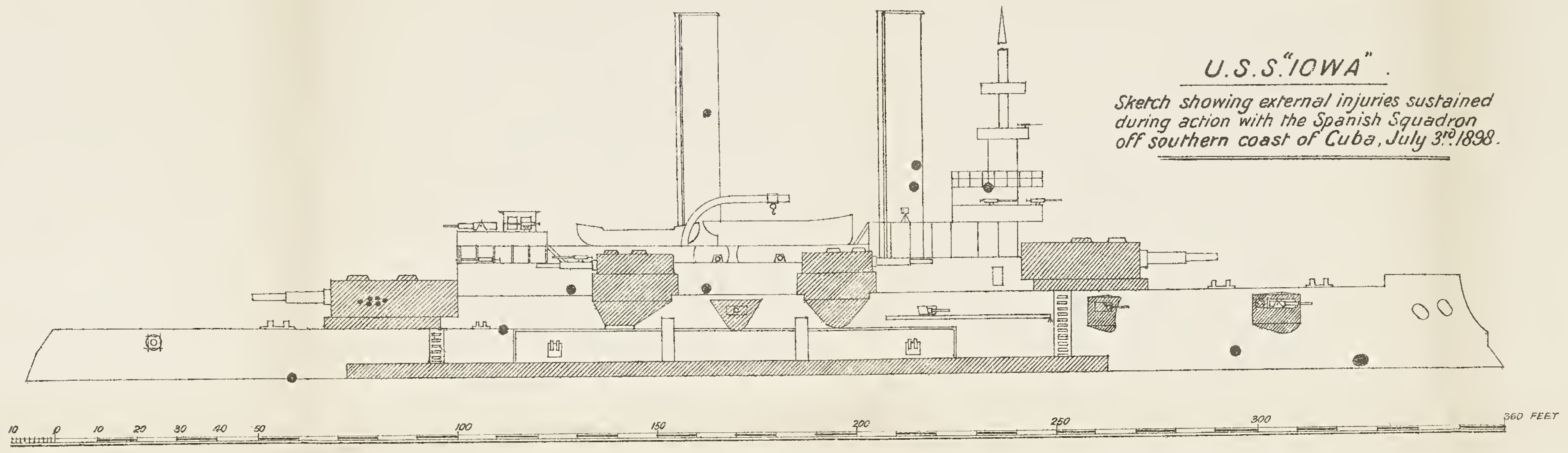


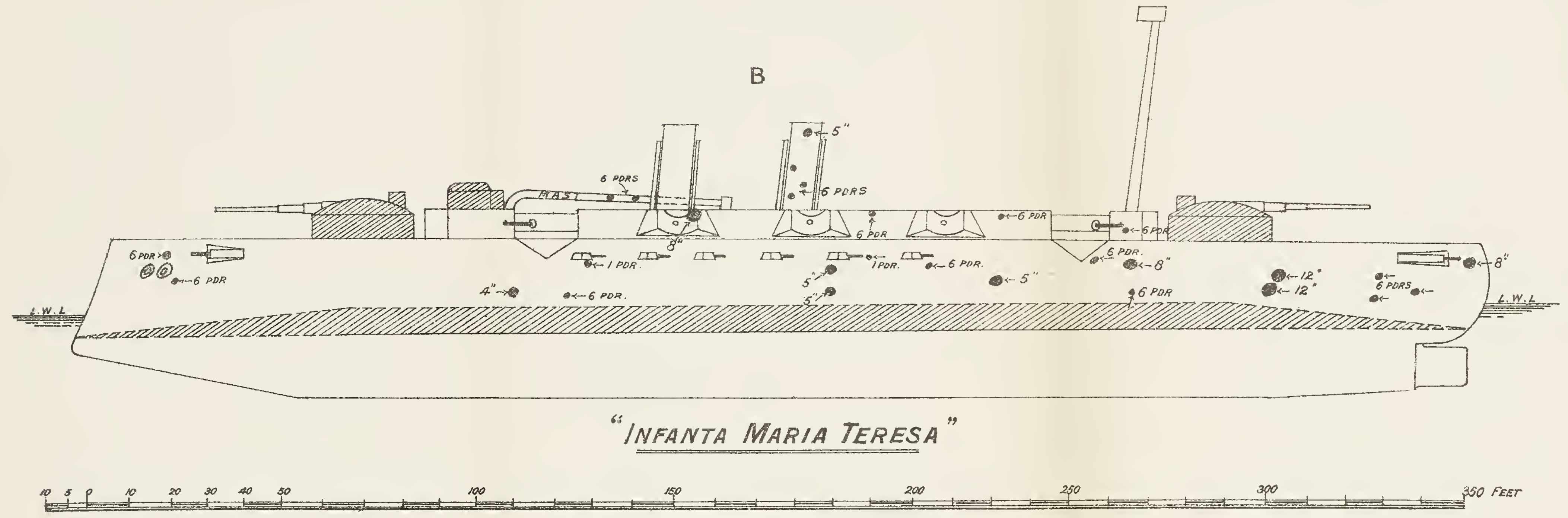
U.S.F.S. "BROOKLYN"

Sketch showing external injuries sustained during action with the Spanish Squadron off southern coast of Cuba, July 3rd 1898.

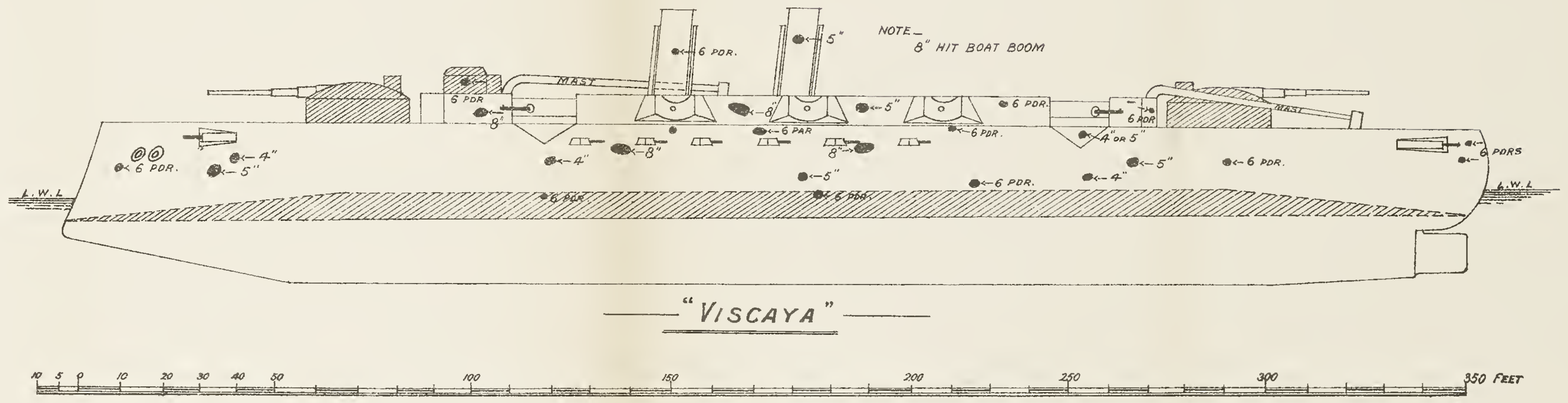


U.S.S. "IOWA".

Sketch showing external injuries sustained during action with the Spanish Squadron off southern coast of Cuba, July 3rd 1898.

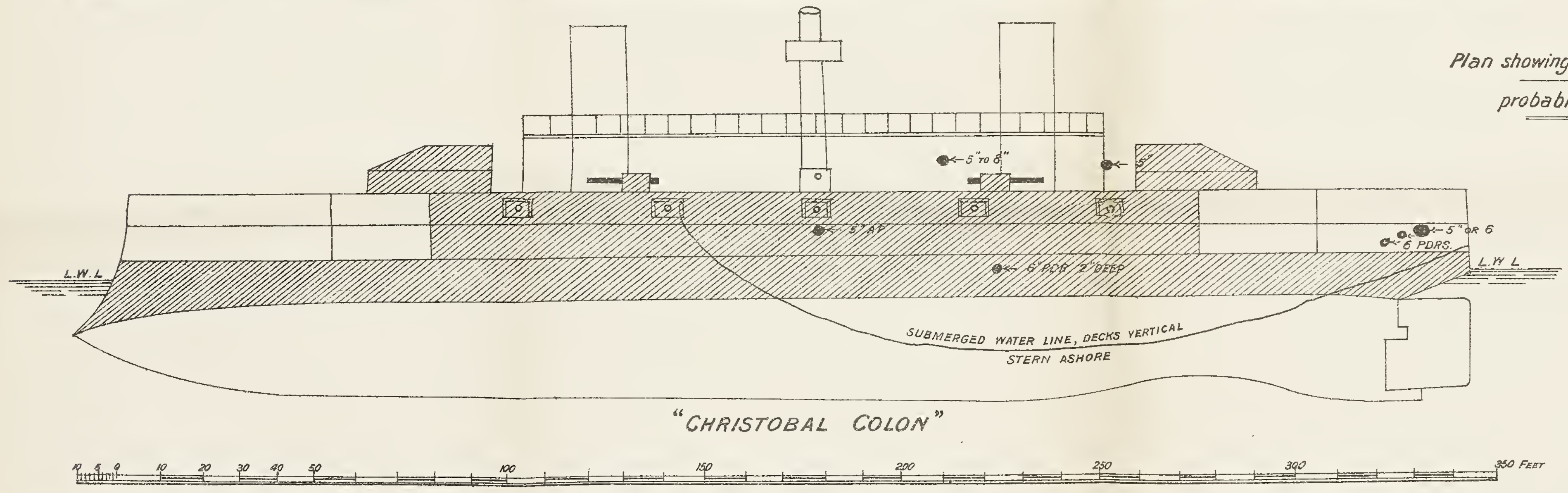


"INFANTA MARIA TERESA"



"VISCAYA"

Plan showing approximate location of hits
and
probable size of projectiles.



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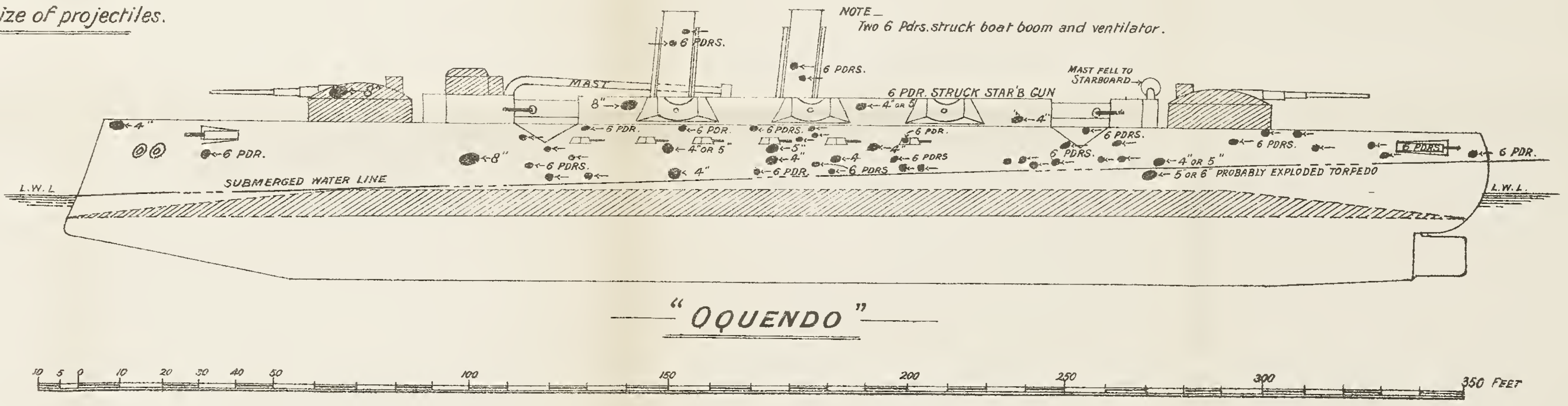
"CHRISTOBAL COLON"



"OQUENDO"

# of Spanish and American Ships at Santiago
ly 3rd, 1898.

Date of launch.

Rectangles representing energy of fire per minute. The entire rectangle is proportioned to the total energy and the shaded portion shows the fire available to one side, that is for one enemy.

Had the *Colon* possessed her primary guns her shaded and total rectangle would have extended to about the portion shown by the dotted lines.

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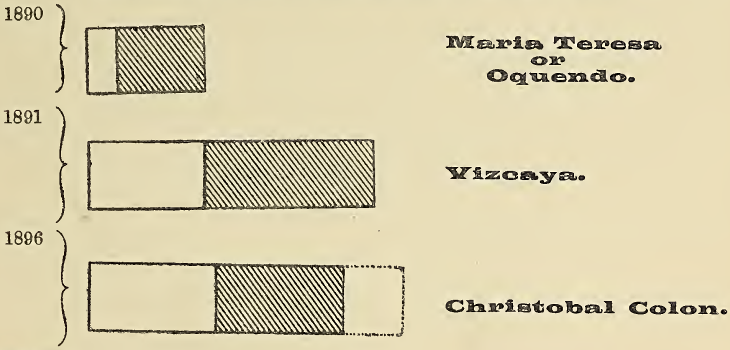

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Date of launch.

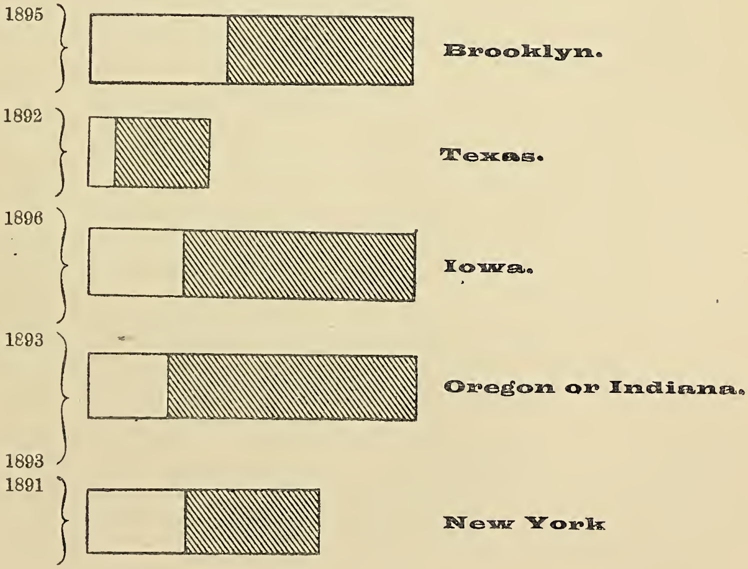


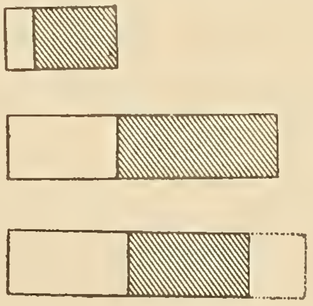
Diagram Shewing Fighting Elements of Spanish and American Ships at Santiago on July 3rd, 1898.

Rectangles representing energy of fire per minute. The entire rectangle is proportioned to the total energy and the shaded portion shows the fire available to one side, that is for one enemy.

Had the *Colon* possessed her primary guns her shaded and total rectangle would have extended to about the portion shown by the dotted lines.

SPANISH ARMOURED CRUISERS.

Name of vessels.	Speed.	Armament.	Energy of fire per minute.	Energy of fire available against one enemy.	Armour.	Date of launch.
	knots.		foot-tons.	foot-tons.		
Maria Teresa.*	20·25	Two 11in. guns.	36,045	36,045	Belt, 12in.	1890
		Ten 5·5in.	23,860	11,930	Gun position, 10½ in.	
		Eight 2·2in. Q.F.	11,000	5,500	Deck, 3in.	
			70,905	53,475		
Vizcaya†... ...	21·0	Two 11in. guns.	36,045	36,045	Belt 12in.	1891
		Ten 5·5in. Q.F.	119,300	59,650	Principal gun position,	
		Two 2·7in. Q.F.	7,338	3,669	10·5in.	
		Eight 2·2in. Q.F.	11,000	5,500	Deck, 3in.	
			173,683	104,864		
Cristobal Colon	20·0	Ten 6in. Q.F.	105,000	52,500	Belt and great part	1896
		Six 4·7in. Q.F.	35,834	17,917	of upper structure,	
		Ten 2·2in. Q.F.	13,750	6,875	6in. Harveyed steel.	
		Primary 10in. guns were deficient.				
			154,584	77,292		



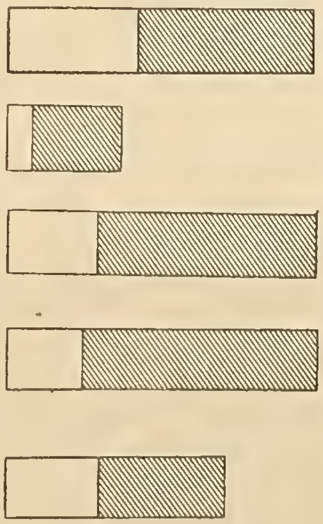
* The Oquendo differed only from the Maria Teresa in the fact that her speed is given as twenty knots, and her date of launch 1891.

† The Vizcaya differed only from the Maria Teresa in the fact that her speed is given as twenty-one knots, and that she carried two additional guns of 2·7in. calibre, and above all that her ten 5·5in. were quick-firing pieces, so that her elements were as above.

AMERICAN BATTLE SHIPS AND CRUISERS.

The American warships which lay outside the harbour were as follows, taking them in the order in which they lay at the moment when the attempt to escape was actually made:—

Name of Vessels.	Speed.	Armament.	Energy of fire per minute.	Energy of fire available against one enemy.	Armour	Date of launch.
	knots.		foot-tons.	foot-tons.		
Brooklyn ... (armoured cruiser)	21·9	Eight 8in. guns.	59,984	44,988	Belt, 3in. to 7in.	1895
		Twelve 5in. Q.F.	121,044	60,522	Gun position,	
		Twelve 6-pr. Q.F.	16,500	8,250	8in. to 5in.	
			197,528	113,760	Deck, 6in. to 3in	
Texas (turret)	17·8	Two 12in guns.	38,978	38,970	Belt, 12in.	1892
		Six 6in. guns.	17,940	8,970	Turret, 12in.	
		Twelve 6-pr. Q.F.	16,500	8,250	Deck, 3in.	
			73,418	56,198		
Iowa	17·0	Four 12in. guns.	77,956	77,956	Belt, 14in. Harveyed steel.	1896
		Eight 8in.	59,984	29,992		
		Six 4in. Q.F.	82,940	16,470	Barbette, 15in.	
		Twenty 6-pr. Q.F.	27,500	13,750	Deck, 3in. to 2½in.	
			198,380	138,168		
Oregon ...	16·7	Four 13in. guns.	100,881	100,881	Belt, 18in. Harveyed steel.	1893
		Eight 8in. guns.	59,984	29,992		
		Four 6in. guns.	11,960	5,980	Barbette, 17in. to 6in.	
		Twenty 6-pr. Q.F.	27,500	13,750		
			200,325	150,603	Deck, 3in.	
Indiana ...	15·5	The same as the Oregon.				1893
New York ... (armoured cruiser)	21·0	Six 8in. guns.	44,988	45,990	Belt, 4in.	1891
		Twelve 4in. Q.F.	65,880	32,940	Gun position, 10in. to 7in.	
		Eight 6-pr. Q.F.	1,100	550		
			111,968	79,480	Deck, 6in. to 3in.	



Appendix to Captain Orde Browne's lecture, 16th March, 1899.

A PORTABLE MAP READER FOR FIELD SERVICE.

BY

MAJOR D. G. PRINSEP, R.A.

HOW often at manœuvres, field-days and such like occasions do officers want a quick and handy instrument either for finding their position or orienting a map or again measuring ranges from one point to another and how vexatious is this at times with a high wind and a map with the scale torn off or put in a corner where it is not readily to be used and with rain or snow perhaps fast reducing the whole thing into a blurred mass of pulp—and think of the language too that has been expended on such occasions, when your fingers are numb and your horse wont stand steady and an irritable umpire, cold and in a hurry, wants to know where you are on the map and what range you were firing at or are going to open fire at etc., etc. Well occasions such as these induced me to evolve an instrument which, after 2½ years of trial, I can confidently assert gives one all the information most urgently required on the field and it can be used mounted or dismounted with the greatest ease.

The instrument* consists of a stout piece of boxwood ⅜ inch thick with both edges bevelled, about 5¼ inches long and 1½ inches wide; on the bevelled edges are cut scales of yards to two inches to 1 mile on one side and three inches to 1 mile on the other and by following the written instructions on the top of the scale maps of 1, 2, 3, 4 or 6 inches to the mile can be read at once.

On the reverse side are two scales of inches and tenths, and inches and eighths, while in the centre I had the fuze scale for the gun I was using pasted on and varnished, but this might I think be printed on a removable slip of wood if preferred. Anyhow it is better than the india-rubber range card for working with as it has no information which is not material for a battery commander to fight his battery with. In the centre is inserted a good compass needle moving in an oblong brass box and glass covered and at the N. and S. ends are marked small variation scales of degrees in the box.

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* A Diagram of the map reader may be seen at the Institution or sent by post on application for inspection and return.

I have found this a strong instrument and one that will bear being knocked about and can be carried in wallets, or pocket of serge or elsewhere, easy to handle and absolutely accurate while its thickness makes it easy to handle quickly even with gloves on and one has not got to fumble about to find a pencil first and then a piece of paper to measure off a distance on a map. The length gives a good line for orienting a map and the scales mentioned will cover all maps likely to be found in English countries. For foreign maps all that is necessary is to paste the scale of the map to be used on one of the bevelled edges. Messrs. Cary, Opticians, Pall Mall, London, made the first one to my design and will doubtless be pleased to make others for anyone requiring them. I have found it particularly useful for ranging a battery, etc., as by putting your thumb or finger across the last range given you know exactly where you are—and I hope others may find it as useful as I have.

AN ARTILLERY OFFICER'S ROUGH NOTES

ON

ARTILLERY IN MANUSCRIPT.

Circa.

A.D. 1755.

BY

COLONEL J. C. DALTON, R.A.

(*Assistant Military Secretary, Head-Quarters Staff of the Army.*)

AN interesting old vellum bound book containing the manuscript notes on all pertaining to the art of the Royal Artilleryman of the middle of the 18th Century has recently come into my hands, and I have had the pleasure of presenting it to the library of the Royal Artillery Institution. I do not propose here to do more than very briefly allude to the professional contents of the book, but the officers to whom it has belonged have kept a few regimental records in it, which, though probably throwing little or no fresh light on the early history of the regiment, may nevertheless be interesting to many who have not got access to the regimental records of that date.

As I am writing this from abroad I have not by me any books of reference with which to compare the details which I give now, except a "Kane's List," but from that I have been able to identify every name herein recorded, and have inserted the "Kane's List" number after the name of each officer.

The book in question evidently first belonged to (No. 205) Lieut. Fireworker Samuel Glegg, who became a Cadet on 1st April, 1755 (according to Kane). His name appears, without any date, in the top corner of the fly-leaf at the end of the book, which has been used for the purpose of entering in the Regimental List, etc., of which I here give copies. This officer was commissioned as Lieut.-Fireworker on 24th April, 1755 and thus was only three weeks a Cadet, and on 12th May, 1756 was made a Second Lieutenant. As he made these lists whilst in the rank of Lieut.-Fireworker, they must therefore have been written before May, 1756, and after April, 1755, so that I do not think we can be far wrong in assigning 1755, as the date of the lists.

In the list headed "List of Artillery officers in 1753–54," I notice that the date was originally put down as 1755, and was subsequently altered by someone to 1753–54. As Glegg's name appears as the junior officer in this list amongst the Lieut. Fireworkers, it is evident that the list could not have been made earlier than 1755, and that this date, originally inserted, was the correct one—always assuming that the notes were written by him. Glegg died in 1760, and the book presumably then passed into the hands of a brother officer, as we find on the fly-leaf at the beginning of the book the name (in more recent writing) "Captain-Lieutenant Thomas Jones, Belle-Isle, 1760–1;" this officer was a contemporary of Glegg as a Cadet (his number in Kane is 225). He was a Cadet of 8th March, 1755, and appears to have been passed over by Glegg, as he did not get his commission until 27th December, 1755; he became Capt.-Lieutenant on 23rd October, 1761, a year after the date of Glegg's death. Unfortunately Kane does not tell us where Glegg died.

Capt.-Lieutenant Thomas Jones was apparently stationed in Belle-Isle about 1760-1; he evidently served in various parts of the continent of America, and was in or about Quebec in 1760 and 1776, for we have in the book in Jones' handwriting some notes on "Fire Ball Composition made at Quebec 1760–A.W. and 1776 by Captain Jones." Jones was killed in 1777 at the disastrous affair of Saratoga. His name does not figure in any of these lists which is in itself a proof that they were written before the end of 1755 when Jones was commissioned. If Glegg was abroad when he wrote the lists, as I think very probable, he would not be likely to have the names of those commissioned after him for some considerable time, as information did not permeate as rapidly in those days as now.

As regards the professional contents of this book there is nothing especially noteworthy about them, the usual data are given as to dimensions of all kinds of Ordnance and their properties, also every detail as to ammunition and the way it was made up and prepared; gunpowder and incendiary compositions, proportions of stores for bomb vessels, gunnery problems, details of carriages, practice tables with guns, howitzers and rockets, stores for fire-ships, etc., etc.

There is one table which might be useful for reference in case one wished to know the details relative to the antique ordnance of 150 years ago. The table is headed—"A table shewing all things necessary to the known of the Names, Proportions, Weights, Lengths, Bullets, Ranges, etc., of a great gun." The names of the guns are given in their orders of magnitude, the smallest is called 'A Base,' then come 'Robinet,' 'Falconen,' 'Falcon,' 'Minion,' 'Saker,' 'Saker old sort,' 'Demi-culverin,' 'Culverin,' 'Demi-Cannon,' 'A Royal whole Cannon.' There are several sizes of the different natures of gun. The 'Base' weighed 200 lbs and had an extreme range of 600 paces; the 'Royal whole Cannon' weighed 8000 lbs. and had an extreme range of 1850 yards, throwing a projectile of 58 lbs.

Towards the end of the book there is a list headed—"Proportion of Ordnance, Ordnance stores, etc., ordered to Fort Edward," and there is a note written in it "The intire Stock-in-Trade of James Hockett, Commissary, Albany, February, 1858." The Ordnance consisted of two 10″ Mortars and 15 Coehorn, four 8″ Howitzers and four Royal Howitzers with a quantity of ammunition, stores, etc.

There is also in Captain Jones' handwriting a list of stores "for forming a small temporal (*sic*) Laboratory for a Battering Train 114 pieces Ordnance."

Loose in the book there is a rough index of the contents which has been written on the back of an old letter. The address on the letter is :—

Mr. Hamilton,
Fort Augusta.

and the letter is as follows :—

"Sir,

"Captain Dobbin desires me to ask the favour of you to order
"Tom to bring up the Pine Cheese to-morrow as it is to go to
"Windward.

"Teusday (*sic*) Morning. (Sd.) James F. Weire."

There is no date, nor guide to shew whence the letter proceeded, neither am I able to explain the context. Fort Augusta was in Georgia, and, about 1750, was occupied by British troops.

Fort Edward above alluded to was on the Hudson river near Glenn's Falls and was an important place in those days. It has now entirely disappeared.

I append the Regimental lists copied verbatim (with a few exceptions) from those in the book. The numbers after the names are the "Kane's List" numbers.

The tables are as follows:—

A.—Copy of a warrant for the officers of artillery to take rank, date 1751.

B.—Establishment of pay of the Royal Regiment of Artillery per diem, date about 1755.

C.—Establishment of the Royal Regiment of Artillery, 1st June, 1756.

D.—List of artillery officers in 1753–4, (?) should be 1755.

E.—Roster, date, about 1755.

F.—List of the officers as they are posted to the several companies in the Royal Regiment of Artillery, date, about 1755.

TABLE "A."

COPY OF A WARRANT FOR THE OFFICERS OF THE ARTILLERY TO TAKE RANK.

GEORGE R.

" Whereas WE have lately been pleased to sign divers commissions
" for the officers of our Royal Regiment of Artillery, and it being Our
" Royal intention that the officers of our said Regiment shall take rank
" in our Army according to the dates of their respective commissions,
" whether signed by Us, our Master-General of the Ordinance, the
" Lieut.-General and Principle officers of our Ordinance, or any other
" Person or Persons whatsoever by which the said officers do now take
" rank in the said Regiment; Our Will and Pleasure therefore, is that
" the officers of Our Royal Regiment of Artillery do upon all occasions
" take rank as follows, viz. :—

Colonel Commandant.	as	Colonel.	of Foot.
Lieutenant-Colonel.		Lieutenant-Colonel.	
Major.		Major.	
Captains.		Captains.	
Captain-Lieutenants.		Captain-Lieutenants.	
First Lieutenants.		Lieutenant.	
Second Lieutenants.		Second Lieutenant.	
Lieutenant Fireworkers.		Ensigns.	

" And of this, Our Royal Will and Pleasure, all officers Civil and
" Military, whom it doth or may concern, are to take Notice and Govern
" themselves accordingly.

Given at our Court at St. James's, this 30 Day of April, 1751, in the Twenty-fourth year of our reign.

By his Majesty's command. (signed) H. FOX."

TABLE "B."

Establishment of Pay of the Royal Regiment of Artillery Per Diem.

Commissioned Officers		£	s.	d.
Colonel-Commander-in-Chief ye Master-General		0	0	0
Colonel en Seconde ye Lieut.-General of ye Ordnance		0	0	0
Colonel-Commandant	N.B.—The stoppages of the pay of Artillery officers for their arrears is one-fourth of their full-pay	1	5	0
Lieut.-Colonel		1	0	0
Major		0	15	0
Captain		0	10	0
Captain Lieutenant		0	6	0
First Lieutenant		0	5	0
Second Lieutenant		0	4	0
Lieutenant Fireworker		0	3	8
Staff Officers.				
Chaplains		0	6	8
Adjutant		0	5	0
Quarter-Master		0	6	0
Bridge-Master		0	5	0
Surgeon		0	4	0
Surgeon's Mate		0	2	6
Non-Commissioned Officers, etc.				
Sergeant	N.B.—The pay of ye Miners is— £ s. d. Sergeants... 0 2 6 Corporals 0 2 0 Miners ... 0 1 6	0	1	7¾
Corporal		0	1	6¼
Bombardier		0	1	4½
Gunner		0	1	1¼
Mattross		0	0	9½
Drum-Major		0	1	4
Drummer		0	0	9½
Gentleman Cadet		0	1	4

Note.—The date of this table is not given, but I should imagine it to be 1755 as it is evidently written at the same date as the rest of the book, by Lieut. Glegg.

TABLE "C."

Establishment of the Royal Regiment of Artillery, 1st June, 1756.

Field Officers	
Colonels ...	3
Lieut.-Colonels ...	1
Majors ...	2
Commissioned Officers.	
Captains ...	20
Captain Lieutenants ...	20
First Lieutenants...	20
Second Lieutenants ...	21
Lieutenant Fireworkers ...	57
Staff Officers.	
Chaplains...	1
Adjutants ..	1
Quarter-Masters ...	1
Bridge-Masters ...	1
Surgeons ...	1
Surgeon's Mates ...	1
Total ...	150

Brought forward ...	150
Non-Commissioned Officers.	
Sergeants ...	64
Corporals...	64
Rank and file.	
Bombardiers ...	144
Gunners ...	360
Mattrosses ...	1128
Miners ...	176
Drum-Major ...	1
Drummers ...	40
Gentlemen Cadets ...	48
Total number ...	2175

TABLE "D."

Sir John Ligonier.
Wm. Belford, Colonel-Commandant[34]
Borgard Michelson, Lieut.-Colonel[35]

LIST OF ARTILLERY OFFICERS IN 1753–4.

George Williamson[31] } Majors.
John Chalmers.[50] }

CAPTAINS.	CAPT.-LIEUTENANTS.	FIRST LIEUTENANTS.	SECOND LIEUTENANTS.	LIEUTENANT FIREWORKERS.	
James Mace[46]	Edward Tibbet[72]	Charles Stranover[94]	James Buchanan[132]	Robert Hind[138]	Robert Hetzler[185]
Thos. Desaguliers[51]	Robert Hind[81]	John Stratton[128]	John McCullock[133]	Benjamin Stehelin[161]	Thos. Collins[186]
Thos. Flight[53]	Charles Farrington[80]	John Innes[113]	Sir Charles Chalmers[134]	Duncan Drummond.[162]	Geo. Groves[187]
Thos. Ord[54]	Jacob Gregory[86]	Thomas Smith[114]	George Charlton[137]	James Lawson[163]	Jos. Walton[188]
James Pattison[55]	Joseph Brome[87]	Phillip Webdall[115]	James Barret[139]	Charles Torriano[164]	Wm. Bowen[189]
Alexr. Leigth[57]	John Northall[88]	Peter Innes[126]	Richard Edlin[141]	Thomas Howdell[165]	Thos. Sheppard[190]
John Skeddy[69]	Abraham Tovey[92]	William McLeod[117]	Thomas Hussey[147]	James Butler[167]	Chas. Campbell[191]
Chas. Brome[70]	Richard Mason[97]	Alexander Campbell[11]	David Hay[149]	David Muckle[168]	Edward Foy[192]
John Godwin[66]	John Dovers[99]	Jacob Tovey[120]	James Stephens[151]	George Forman[169]	Augustus Dunford[193]
John Farquharson[71]	Robert Smith[101]	Thomas Pike[121]	William Phillip[153]	James Halsall[171]	Wm. Venner[194]
Thos. James[73]	Leonard Pattison[102]	Joseph Winter[123]	John Yorke[154]	John Molman[170]	Fleming Martin[105]
Richard Maitland[74]	William Hussey[103]	Edward Whitmore[127]	Andrew Ferguson[155]	Thomas Baker[172]	John Chalmers[196]
Samuel Cleaveland[83]	Samuel Streachey[107]	Forbes McBean[129]	George Anderson[156]	Primrose Elphinstone[174]	Joshua Jeffrys[197]
William Hislop[93]	William Martin[109]	Griffith Williams[131]	David Rogers[157]	David Day[177]	John Smith[198]
	Nathaniel Jones[111]		Horatio Spry[160]	George Lewis[176]	Wm. Corbett[199]
				Wm. Gostling[178]	Daniel Sweet[200]
				Thos. Blomer[179]	Alexr. Johnston[201]
				John Carter[180]	John Scott[202]
				Jonathan Lewis[181]	John McCullock[203]
				Geo. Campbell[182]	David Dundass[204]
				Thos. Rogers[183]	Saml. Glegg[205]
				Alex. Chalmers[184]	

TABLE "E."

ROSTER.

CAPTAINS.	CAPT.-LIEUT.	FIRST LIEUTENANTS.	SECOND LIEUTENANTS.	LIEUTENANT FIREWORKERS.
Thomas Desaguliers[51]	Charles Farrington[80]	Charles Stranover.[94]	William Phillips[153]	Thomas Baker[172]
John Godwin[66]	Joseph Brome.[87]	Forbes Macbean[129]	David Hay[149]	Samuel Glegg.[205]
Samuel Cleaveland[83]	Samuel Streachey.[107]		George Anderson[156]	Fleming Martin[195]
James Mace[46]			George Charlton[1]	William Venner[194]
Thomas James[73]				Augustus Dunford[193]
				Edward Foy[192]
				Charles Campbell.[191]
				Thomas Sheppard.[190]
				Joseph Walton.[188]
				Thomas Blomer.[179]
				George Lewis[176]
				John Molman[170]
				Charles Torriano.[164]

Note.—There is no date to this Roster which I imagine to be the roster of officers about the year 1755 at the Station where Lieut.-Fireworker Samuel Glegg joined. It may have been at Woolwich or in America. Lieut.-Fireworker Glegg was the junior of all these officers—he was a Cadet, 1st April, 1755 and commissioned as a Lieut.-Fireworker 23 days later on 24th April, 1755. He became a 2nd Lieutenant on 12th May, 1756. As he appears in this list as a Fireworker the list must have been written between April, 1755 and May, 1756. He died, 1760.

TABLE "F."

LIST OF THE OFFICERS AS THEY ARE POSTED TO THE SEVERAL COMPANIES IN THE ROYAL REGIMENT OF ARTILLERY.

	Capt.-Lieutenant Charles Farrington.[84] Second Lieutenant William Phillips.[153] Lieut.-Fireworker Charles Campbell[191] Cadet Company.		
No. 1 Capt. James Mace's Co.[46] *Virginia* Capt.-Lieut. Robert Hind.[81] First Lieut. John Stratton,[128] [*Ireland.* Sec. Lt James Buchanan, *Vir* [132] James Lawson, *E.I.*[163] Joseph Walton.[188] Thomas Sheppard.[190] Lieut.-Firework'rs.	**No 2.** Capt. Thos. Desagulier's[51] Co. [*East Indies.* Capt.-Lt. Leonard Pattison.[102] First Lieut. Forbes Macbean[129] Second Lt. George Anderson[156] David Muckle, *E.I.*[168] John Molman.[170] Fleming Martin.[195] Lieut.-Firework'rs	**No. 3** Capt. Thomas Flight's[53] Co., [*Minorca.* Capt.-Lieut. Jacob Gregory[86] First Lt. Phillip Webdall.[115] Second Lt. James Stephens[151] Benjmn. Stehelin[161] George Forman.[169] David Day.[177] Lieut.-Firework'rs	**No. 4** Capt. Thos. Ord's[54] Co., [*Newfoundland.* Capt.-Lieut. John Dovers.[99] First Lieut. Griffith Williams.[131] Second Lieut. David Rogers.[157] Primrose Elphinstone[174] George Lewis.[181] Thomas Rogers.[183] Lieut-Fireworkers
No. 5 Captain James Pattison's[55] Co., [*Scotland.* Cap.-Lieut. Edward Sibbet.[72] First Lieut. Thomas Smith.[114] Second Lieut. Horatio Spry.[160] Dunkin Drummond[162] Joshua Jefferys.[197] David Dundass.[204] Lieut.-Fireworkers	**No. 6** Capt. Alexander Leigth's[57] Co., [*Gibraltar.* Capt.-Lieut. Abraham Tovey.[92] First Lieut. John Innes[113] Second Lieut. John York.[154] Robert Hind[138] James Butler[167] John Carter[180] Lieut.-Fireworkers	**No. 7** Capt. John Skeddy's[69] Co., [*East Indies* Capt.-Lt. Richard Mason.[97] First Lieut. Joseph Winter[123] Sec. Lt. Sir Chas. Chalmers[134] Jonathan Lewis.[181] Daniel Sweet.[200] John Scott.[202] Lieut.-Firework'rs	**No 8** Captain Charles Brome's[70] Co., [*Novia Scotia.* Capt.-Lieut. William Martin.[109] First Lieut. Peter Innes.[126] Sec. Lieut. Andrew Ferguson[155] William Gostling.[178] Thomas Collins.[186] Alexander Johnston.[201] Lieut-Fireworkers.

TABLE "F."—*Continued.*

No. 9	No. 10	No. 11	No. 12
Captain John Godwin's^{66} Co. [*Virginia.* Capt.-Lieut. Robert Smith^{101} *killed.* First Lieut. William McLeod^{117} [*Vir* Second Lieut. George Charlton^{137} Charles Torriano^{164} } Lieut.-Fire-workers. Edward Foy.^{192} } Lieut.-Fire-workers. Samuel Glegg^{205} } Lieut.-Fire-workers.	Capt. John Farquharson's^{71} Co., [*East Indies.* Capt.-Lt. Samuel Streachey^{107} First Lieut. Jacob Tovey^{120} Second Lt. Thos. Hussey^{147} George Campbell^{182} } Lieut.-Fire-workers Robert Hetzler^{185} } Lieut.-Fire-workers George Groves^{187} } Lieut.-Fire-workers	Capt. Thomas James'^{73} Co. [*Station not given.* Capt.-Lieut. Joseph Brome^{87} First Lieut Alex. Campbell,^{118} *E.I.* Second Lt. John McCullock,^{133} *Vir.* Thomas Baker^{172} } Lieut.-Fire-workers Thomas Blomer^{179} } Lieut.-Fire-workers William Venner^{194} } Lieut.-Fire-workers	Captain Richard Maitland's^{74} Co., [*East Indies.* Capt.-Lieut. John Northall.^{88} First Lieut. Edward Whitmore.^{177} Second Lieut. Joseph Barret.^{139} John Chalmers^{196} } Lieut.-Fire-workers. John Smith^{498} } Lieut.-Fire-workers. William Corbett^{199} } Lieut.-Fire-workers.
	No. 13	No. 14	
	Capt. Samuel Cleaveland's^{83} Co. [*Nova Scotia.* Capt.-Lieut. William Hussey.^{103} First Lieut. Charles Stranover,^{94} *Leave to retire.* Second Lieut. David Hay^{177} Thos. Howell,^{165} *Vir* } Lieut.-Fire-workers James Halsall,^{171} *E.I.* } Lieut.-Fire-workers Augustus Dunford^{193} } Lieut.-Fire-workers	Capt. William Hislop's^{93} Co., [*East Indies.* Capt.-Lt. Nathaniel Jones^{111} First Lieut. Thomas Pike^{121} Second Lt. Richard Edlin^{141} Alexdr. Chalmers^{184} } Lieut.-Fire-workers William Bowen^{189} } Lieut.-Fire-workers John McCullock^{203} } Lieut.-Fire-workers	

N.B.—There is no date to this list, but it appears to be 1755, the same as the other lists. The "Kane's List" numbers are given in figures at the end of each name and the other notes appear as such in the original.

E.I. refers to the East Indies; *Vir.* to Virginia; *Gib.* to Gibraltar. All these officers names correspond with those on Table " D.

THE CONNECTION BETWEEN "KANE'S LIST"

AND

CAPTAIN R. J. MACDONALD'S "HISTORY OF THE DRESS OF THE ROYAL ARTILLERY."

BY

MAJOR A. J. ABDY, R.A.

[The writer requested that his name might be withheld in publication, but the Committee feel sure that members would wish it to be associated with this interesting and valuable paper, especially when it is remembered that Major Abdy has worked so hard and so successfully for the Institution of late years.—*Secretary R.A.I.*]

NOW that the "History of the Dress of the Royal Artillery" is published the following paper may prove of interest as showing the men who may have worn the various dresses therein depicted.

The numbers in brackets after a name are those of the officer in "Kane's List."

The first two or three plates treat of a period anterior to the date when Kane commences. We may regard the dress of Plate I as that in which a party paraded in Hyde Park on 23rd May, 1676 in accordance with an order from the Duke of Monmouth directing Sir Thomas Chichelay, The Master General of His Majesty's Ordnance ‘ to cause eight field pieces . . . attended with a competent number of gunners, fifty pioneers, with their respective officers *in their* ‘ *best equipage* to attend the exercise of the said forces . . . ’. The campaigns which occurred in the long period covered by Plate I. include those of Tangier, of the Spanish Netherlands, of Monmouth's rebellion, of 1689-91 in Ireland, of Holland and Flanders; for service in each of these campaigns trains of artillery were formed; and the more noted Artillerymen serving in these trains were Sir William Compton, Master General of the Ordnance, Colonel William Legg, Lieutenant of the Ordnance, Colonel James Weymes (Wemyss), Master-Gunner of England in 1660 and George Legg, the son of William, who in reward for political and naval services was made assistant in the Board of Ordnance in 1682 and raised to the peerage as Lord Dartmouth the same year.

Captain Martin Beckman, Engineer-General of Tangier in 1662 became fire-master in 1664 and rose to be Colonel of the various trains formed between the years 1691 and 1695 and as such commanded the artillery at the battles of Steinkirk and Landen, at the sieges of Namur and Huy and at the bombardments of St. Malo, Brest, Dieppe, Havre and Palamos. In most of these trains the name of Jacob Richards appears but he, probably, was more of an engineer than artilleryman. In 1691 Albert Borgard (No. 1), the Father of the Royal Regiment of Artillery, joined the English artillery in Flanders as Fire-Master under the command of Colonel Goor ; he was one of the most famous artillerymen that ever lived and study of the short biography of his life in "Kane's List" will explain how this soldier of fortune came to exercise so great an influence on the Regiment.

Particular atention is called to him as he appears to be a strong connecting link between the pre-regimental period of Plate I and what may be called the semi-regimental period of Plate II.

Before going further it may be well here to draw the attention of the student of Regimental History of this period to the following works viz. "Notes on the Early History of the Royal Regiment of Artillery" by the late Colonel Cleaveland (No. 83) R.A. published at the R.A.I., Woolwich, the "Master-Gunners of England" and "Memoirs historical and biographical; the Brome 'family'" both by Major R. H. Murdoch, R.A., as published in Vols. XIX. and XX., R.A.I. "Proceedings", "England's Artillerymen" by J. A. Browne and last but best of all Vol. I of the "History of the Royal Artillery" by the late Colonel F. Duncan (No. 2492) C.B., R.A.

I have spoken of the period 1702-1714 as the semi-regimental period but its commencement might fairly be antedated to 1693 when the Flanders establishment of artillery train comprised four companies while on the 1st May, 1698 was established a *regimental* trayn of artillery to be kept in pay in time of peace and from that date onwards. *Companies* of gunners are always mentioned in the warrants appointing various trains.

Among the officers who wore the uniform of Plate II in the series of glorious victories under Marlborough at Blenheim, Malplaquet, Ramillies and elsewhere are Holcraft Blood, Michael Richards, Borgard (No. 1)' Jonas Watson (No. 2) and William Bousfield (No. 4)—Blood was a man equally famous in the artillery and engineering branches of the ordnance; his name first appears in Cleaveland's Notes as the Captain of the pioneers in the list of the train of Artillery formed by virtue of James II warrant dated 8th November, 1688 and thenceforward his name appears constantly in the list of trains, generally as an engineer; at the battle of Blenheim he distinguished himself by keeping the enemy's foot in check with his nine field pieces loaded with cartridge shot; he was made brigadier-general in 1705 and died in 1707; his name is not in "Kane's List".

In this period many artillerymen did good service with Borgard under the Earl of Peterborough in Spain, notably James Richards (No. 5) and Jonas Watson (No. 2) and, while Borgard was absent in command of the Artillery at the siege and capture of Minorca, Michael Richards became Commander-in-Chief of the British Artillery in Spain; he too is a great artilleryman whose name is not in "Kane's List" and it would be interesting to know what was the relationship between Michael, Jacob and James Richards who served through the periods of Plates I and II.

In 1743 the date of Plate III the Artillery has become a definite Regiment; in that year the battle of Dettingen was fought on 13th June; among others there present as a Captain was William Belford (No. 34); in April, 1743 Thomas Desaguliers (No. 51) became a Captain-Lieutenant; he may be regarded as the Father in science of the Regiment as he was the first Royal Artilleryman honoured by election to a fellowship of the Royal Society; Charles Brome (No. 70) who has mustered as a Matross in 1709 became a 1st Lieutenant on the 6th April, 1743 when Joseph Brome (No. 87) was still a Fire-worker Albert Borgard was Colonel-Commandant of the Regiment with the army rank of Lieutenant-General; in this year Captain-Lieutenant Withers Borgard (No. 42) died in Flanders while on the first September Samuel Cleaveland (No. 83) was commissioned as a 2nd Lieutenant and Forbes Macbean (No. 129) on the 3rd August became a Cadet-Matross.

Cleaveland is one to whom the Regiment owes a heavy debt as it was he who first compiled notes relating to the early history of British Artillery and from these notes most of the information about Plates I and II is extracted.

The dress of Plate IV 1760 may be considered to be that in which Royal Artillery officers had fought at Minden in 1759; here Griffith Williams (No 131) commanded four 14 prs. with great success; William Phillips (No. 153) was in command of all the British artillery which rendered so good an account of itself that Prince Ferdinand of Brunswick especially thanked and complimented in his general order to the army Colonel Phillips (No. 153), Captains Macbean (No. 129) Drummond (No. 162) and Foy (No. 192) and in addition sent to each of these officers a letter of thanks and present of money for their services at Minden.

Among the young artillery officers present at this battle was Vaughan Lloyd (No. 241) who, first commissioned as a 2nd Lieutenant on 4th January, 1758 survived Waterloo and died in harness as a Colonel-Commandant and Commandant at Woolwich on 16th June, 1817; there are several caricature portraits of him in the portfolios of the Royal Artillery Institution.

In 1751 Albert Borgard the Father of the Regiment had died; his portrait in oils hangs in the R.A. Mess, Woolwich. In the period concluding with 1760 the year 1755 was one of peculiar interest to officers serving in the present regiment formed as it is by the amalgamation of the Royal and Royal Irish Artillery with the Corps of Bengal, Madras and Bombay Artillery; for it was in 1755 that four companies of artillery under Royal Artillery officers were raised and embarked for service in India. These companies contained men who did good service in the East; notably, John Chalmers senior (No. 50), Richard

Maitland (No. 74) who in February, 1759 sailed from Bombay in command of the land forces of the expedition which captured Surat and thus was probably the first Royal Artillery officer who commanded a mixed force in the field; James Wood (No. 209) saw much service in Chalmers's company, both in Europe and in the East and returned home to become Chief Fire-Master in 1786. Several of these Royal Artillery officers were present under Clive at Plassey on 23rd June, 1757.

At the battle of Warburg on the 30th July, 1760 the British Artillery, again under the command of Colonel Phillips, for the first time came into action at a gallop.

Before leaving this period attention must be turned to North America where the French lost Canada chiefly by the fall of Louisbourg in 1758 and finally by Wolfe's victory at Quebec on the 13th September 1759. Of the former affair the Royal Artillery Institution possesses a most interesting relic in shape of a picture of the siege in black and white 'drawn on the spot' by Thomas Davies (No. 228). At this siege the artillery was commanded by George Williamson (No. 31).

At Quebec the only artillery officer present with fifty gunners at the battle on the plains of Abraham was John Yorke (No. 154) who in the famous picture is shown supporting Wolfe in his arms.

Plate V. 1764 is a period containing the end of the seven years' war. Francis Downman (No. 299) and Thomas Ross (No. 43) were two out of a large number of Royal Artillery officers who saw constant service between 1760 and 1764 in the West Indies, including the sieges of Dominica, Havana and Guadaloupe. In the expedition to Belleisle under Commodore Keppel and General Hodgson in June, 1761 there was a large force of artillery commanded by Desaguliers (No. 51) and under him were Abraham Tovey (No. 92) and Benjamin Stehelin senior (No. 161). On the 10th September, 1762 Stephen Payne Adye (No. 308) was commissioned as a 2nd Lieutenant and since that date there has not ceased to be an officer of his name and family serving in the Royal Artillery.

Plate VI. 1778 was in a period of comparative peace. Ten years before in February, 1768, Thomas Deane Pearse (No. 303) was transferred to the East India Company's artillery in Bengal, where the good work he did is best described in the following words of Captain E. Buckle, Bengal Artillery the historian of that Corps:—'For twenty years he 'commanded the regiment, and under his eye it grew from infancy to 'maturity and passed through many trials yet always winning for itself 'thanks and praises; to his exertions in instructing all parties in the 'details of their duties it owed its excellence, and long as the regiment 'may last, and high as its fame may rise. the name of Pearse ought always to be gratefully associated with it.'

A small and faded but very striking portrait of Pearse hangs in the West Ante-Room of the Royal Artillery Mess, Woolwich.

Plate VII. 1793. This is the year of the first formation of the Royal Horse Artillery. Frederick the Great has the credit of introducing horse artillery on the Continent but galloping guns had long been thought of in the British service, so much so that on 5th June, 1725 the Board of Ordnance approved of the designs of galloping carriages for 6-prs., 3-prs. and 1½-prs., submitted by Thomas James (No. 21); evidently these came to nothing for it was not until 1793 that the Duke of Richmond, Master-General of the Ordnance, succeeded in forming two troops. Robert Lawson (No. 369) obtained command of the first or 'A' troop, since become famous as 'The Chestnut Troop'; John Macleod (No. 456) obtained command of the other troop as a reward for his exertions as head of the Regimental staff of the Royal Artillery at the time when they were formed; Vaughan Lloyd (No. 241) was appointed Lieutenant-Colonel of the Horse Brigade. The first time the Royal Horse Artillery saw service was in 1799 when 'A' Troop in Holland fought under the Duke of York at Egmont-op-Zee, commanded by Thomas Judgson (No. 522).

The uniforms in Plate VIII. 1794, were those worn by Charles Newhouse (No. 707) and the gunners under his command at Toulon in 1793 where John Lemoine (No. 635) distinguished himself as a young officer

From 1778, the date of the last Plate, No. VI., in which other than Royal Horse Artillery is depicted, down to 1794 was a period full of action for British arms as it includes the American War of Independence, the great Siege of Gibraltar, Coote's victories in India and the beginning of the Wars of the French Revolution in 1793. Disastrous as was the result of the American war to Britain and her generals several Artillery officers contrived to win distinction from it; in particular William Phillips (No. 153), who has already been mentioned in command of the Artillery at Minden and Warburg, joined the army in America in 1776, the second year of the war, fought in several actions, was made prisoner, was exchanged for the American General, Lincoln, rejoined the army and died of disease at Petersburg, Virginia in May, 1781. There is a very fine engraving of him of which a copy hangs in the Royal Artillery Institution and under it there is a photograph of Old Blandford Church, Virginia, where he is buried and where a stone has lately been placed over his grave by the kind action of some American gentlemen, admirers of the local traditions of Phillips and his character.

Sir W. Congreve (No. 260) commanded the Artillery in several of the earlier campaigns of the American war; of him also the Royal Artillery Institution possesses a very good engraving, representing him at a later period in his career.

Among the more famous of the many Artillerymen who served in America were (Sir) Anthony Farrington (No. 214), John Yorke (No. 154), Griffith Williams (No. 131); the last named I have already mentioned as present at Minden and of him the Royal Artillery Institution possesses a fine half-length portrait in oils presented by his nephew Charles Williams Esq.; to continue the list in America—Francis Downman (No. 299), (Sir) Thomas Blomefield (No. 334), Robert Douglas(No. 424), (Sir) John Smith (No. 458), (Sir) Edward Howorth (No. 484), George Cookson (No. 566) and George Rochfort (No. 253).

In the defence of Gibraltar a very great force of Artillery was engaged throughout and it is interesting to note that Lord Heathfield, the general commanding had commenced his service in the Royal Artillery as George Augustus Elliot (No. 39) having been enrolled as a cadet gunner on 1st October, 1739, first commissioned as a 2nd Lieutenant, 1st April, 1740 and transferred in that rank to the Engineers, 1st July, 1741; the Royal Artillery Institution possesses a good engraving by Bartolomi of his portrait by Paggi.

Through the long siege, the command of the Royal Artillery was held by at least three officers, viz. Abraham Tovey (No. 92) who died there 7th March, 1781, Griffiith Williams (No. 131) and George Lewis (No. 176). Among those who distinguished themselves at the siege probably the youngest officer was George F. Koehler (No. 605) who invented a depression gun carriage; the Royal Artillery Institution possesses a volume of coloured plates of Gibraltar including one of this carriage, reproduced from pictures by Koehler. Other officers present were Philip Martin (No. 231), Vaughan Lloyd (No. 241), Thomas Seward (No. 463) and James Bogg No.512). P. Martin (No. 231) must not be confounded with William Martin (No. 109) the man who by his agitation and petition obtained for the Field Officers of the Royal Artillery equal rights of rank with the rest of the army.

The portions of the Wars of the French Revolution that come under consideration with Plate VIII. are those in Flanders and the north of France; the former has been mentioned in connection with Royal Horse Artillery. There was a large force of Artillery engaged in Flanders in 1793-94; here it was that Henry Shrapnel (No. 588) saw service and was wounded near Dunkirk in 1793; it was however by the invention of the projectile bearing his name that "Shrapnel" has become more widely known throughout the world than the name of any artilleryman. The Royal Artillery Institution purchased a few years ago an excellent half-length portrait in oils of Shrapnel painted by Arrowsmith, R.A.

(Sir) Wiltshire Wilson (No. 596) distinguished himself greatly in Flanders in 1793-94 and of him the Royal Artillery Institution possesses a small crayon whole figure portrait presented by Colonel C. E. S. Scott (No. 2432). In Flanders (Sir) William Robe (No. 654) first saw active service. Before leaving 1794 I would call attention to Nelson's famous brigade in Corsica where two Royal Artillerymen who had the honour of serving under him at the capture of Bastia and Calvi were Charles Newhouse (No. 707) and Alexander Duncan (No. 740).

As has been said in the Introduction to the "History of the Dress of the Royal Artillery" the question of uniform did not excite much attention in the British army previous to 1815 and as in the years 1797-1815 the wars, so far as the Royal Artillery was concerned, were either those due to the French Revolution or the American War which was largely fostered by the French, I find it best to treat together the period covered by Plates IX, X, XI, XII, XIII; 1797-1815.

Many and famous as were the services of Royal Artillerymen in this period, it is safe to say that works describing the military events and heroes of this period are at least ten times as numerous as those treating of any previous period; therefore I should only be going over old ground were I to attempt to give detailed accounts of the glorious deeds of Royal Artillerymen of this period and shall merely note the names of the more distinguished of them and call attention to services that seem likely to be forgotten or somewhat lost in the shade of more brilliant deeds.—

Robert Lawson (No. 369) commanded the Royal Artillery in Egypt under Abercrombie in 1801; (Sir) Thomas Blomefield (No. 334) commanded the Royal Artillery at Copenhagen in 1807 and under him served (Sir) William Congreve (No. 260); (Sir) John Macleod (No. 456) commanded the Royal Artillery in the Walcheren Expedition 1809 and with the intermission of this service was Deputy-Adjutant-General, Royal Artillery from the commencement of that office in 1795 down to 1827; George Cookson (No. 566) served in Egypt, Copenhagen, Corunna and Walcheren; (Sir) William Robe (No. 654) and (Sir) Thomas Downman (No. 742) continued in the Peninsula that good start they made in Flanders.

Among thers who rose to greatness in this period were (Sir) George A. Wood (No. 644), (Sir) Augustus S. Frazer (No. 765) and (Sir) Alexander Dickson (No. 844). Of the last named it may be said that his strong individuality, varied war services, great knowledge of the world in general and the art of artillery in particular, combined to make him exercise an influence over the Royal Artillery in this century similar to that exercised by Borgard in earlier days. The Royal Artillery Mess, Woolwich, possesses a life-size portrait in oils and the Royal Artillery Institution a charming minature portrait of Sir Alexander while, through the kindness of his son (Sir) Collingwood Dickson (No. 1874) the Royal Artillery Institution has charge of all the professional manuscripts, diaries and notes made by Sir Alexander from an early date in his service down to within a few days of his death.

To resume the list of Peninsula heroes—Robert Bull (No. 845), (Sir) John May (No. 883), (Sir) Hew D. Ross (No. 890), (Sir) Robert W. Gardiner (No. 979), (Sir) Edward C. Whinyates (No. 1002) all saw much service.

Nearly all these officers were also present at Waterloo on which glorious field died three officers whose names will ever be associated with the fame of the Royal Horse Artillery; they were Norman Ramsay (No. 1019), Robert M. Cairnes (No. 1106) and William Livingstone Robe (No. 1390). Ramsay was regarded throughout the Regiment as the *beau-ideal* of a Horse Artilleryman; his treatment by the Duke of Wellington at and after the Battle of Vittoria aroused the sympathy not only of his brother officers but of all those of the Army generally who knew the circumstances of the case; this is well described in Vol. II. of Duncan's "History of the Royal Artillery"; Napier's account of Ramsay's dash with two guns of Bull's Troop through the French Cavalry at Fuentes d'Onoro has made that action a favourite subject for the artist's brush; another reference should be made to Vol. II. of Duncan's History for the account of Ramsay's death at Waterloo and the loss caused to the Regiment thereby.

In the Royal Artillery Mess, Woolwich, there is a life-size bust portrait in oils of Ramsay which shows us a man of fresh complexion and charming expression, beneath the picture hangs a photograph of the church of Inveresk, Musselburgh, to which place Ramsay's mortal remains were removed from Waterloo. Major Cairnes had served with distinction at Copenhagen, Barossa, in several sieges and battles of the Peninsula and had been posted to 'I' Troop as 2nd Captain in 1814; he was a man of extraordinary popularity and there exist most interesting and amusing letters written by him to various brother officers; though only 29 years of age at the time of his death he had been on active service for nearly eight years. The third of this trio was a son of Sir William Robe (No. 654) and his was an even more remarkable record of service than that of Major Cairnes for he died on 19th June of wounds received at Waterloo, aged 24 years on his thirtieth battlefield. The Royal Artillery Institution numbers among its most precious possessions a case containing the minatures of the two Robes surrounded by their respective medals and decorations.

So recently as the 16th November, 1891, there passed away in the person of Major F. Bayly (No. 1473) an officer who had fought in the Peninsula from 1810 to 1814, in America in 1814 and who had accompanied the Prussian army to France after Waterloo; he is a connecting link of one life only between the lives of every officer now serving and that of Vaughan Lloyd (No. 241) who had fought at Minden.

Plate XII. deserves special attention from the fact that the Rocket Brigade under the command of Captain Richard Bogue (No. 1015) was the only British force present at the battle of Leipzig on 18th October, 1813. Bogue was killed but the splendid services of the Rocket Brigade were acknowledged by the thanks of the Crown Prince of Sweden, conveyed to Lieutenant Fox Strangways (No. 1365) by Lieut.-General Sir C. Stewart who said, speaking of the use of the new Congreve Rockets, . . . "I felt great satisfaction at witnessing " this day, a species of improved warfare, the effects of which were truly " astonishing and produced an impression upon the enemy of some- " thing supernatural."

Plate XIII. is the last of a series which show the uniform through years of nearly continuous war and henceforth new conditions of service and thought came into play.

I have previously pointed out how that prior to 1815 but small attention was paid to the dress of officers; the Duke of Wellington is believed to have had no prejudices in favour of uniformity of dress either of armies or of units composing those armies, so that in 1815 when the Allies commenced the occupation of France and of Paris in particular, officers of the British Army,with whom considerations of dress were but small, were brought into contact with officers of other European Armies and as their minds were no longer occupied with schemes of war each had ample opportunity to mutually study, copy or criticise the others dress.

How far the British officer was affected by what he saw can be judged by the caricature published by Fores in 1818, called 'Military Dandies'; there is a copy of it in the Royal Artillery Institution and though it may be said that caricature is at best a distortion of history the fact remains that did no tendency towards the exaggeration depicted exist the caricature would be pointless.

In 1815 the Prince Regent was the leader of Society and it is safe to say that in his mind, dress and uniform counted for much, so that, what with court and society functions and the passing of officers on leave to and from France, the question of the dress of officers became one of great interest. The peace of 1815 and the return of British troops from the occupation of France and Belgium were followed by a large reduction in the strength of the Royal Artillery; to such a point was this reduction carried, that in 1848 Sir Robert Gardiner (No. 979) reported that in the whole of Great Britain there were only thirty-four guns fit to take the field and in case of emergency fourteen guns were the utmost that could be put in the field from Woolwich; the Garrison Artillery in the same way was without men to work the guns of the various forts both at home and abroad.

Under these circumstances so far as "Kanes List" is concerned I shall treat as one the period of Plates XIV.—XIX. from 1815 to 1850. During this long period of peace, broken only by the sending of a British Legion to Spain in 1836 and of expeditions against the native disturbers of various British Colonies, the interest of Artillery officers in the strictly professional portion of their duties did not suffice for many of those with keen minds who turned their attention to various branches of science. An officer who probably influenced a number of cadets in favour of science, was William Mudge (No. 584) who in addition to having charge of the Trigonometrical Survey of Great Britain was made Lieut.-Governor of the Royal Military Academy in July, 1809 and as such took particular care of the instruction of cadets in surveying and topographical drawing. Two other officers, whose scientific work had great influence on their brother officers, were (Sir) Edward Sabine (No. 1180) and Francis Rawdon Chesney (No. 1239) while (Sir) Howard Douglas (No. 783) rendered invaluable services both to the Army generally and to the Royal Navy, and after leaving the Regiment in 1804 on transfer to the Royal Military College; his works on Naval Gunnery continued to be the standard books on that subject down to the disappearance of smooth-bore ordnance. Sabine made for himself a name famous in the world of science and achieved the summit of ambition for an English man of science by election to the position of President of the Royal Society, which post he filled from 1861 to 1871. His principal works were those on the subject of magnetic variations and observations, experiments connected with the swing of a pendulum and also on Polar research; his war services include the Peninsula and Canada. There is a beautiful portrait of Sabine, by Watts, in the Royal Artillery Mess, Woolwich.

Chesney's best work was that connected with the exploration and survey of a railway route to India by the Euphrates Valley but he also made one of the first surveys for a Suez Canal and is believed to have influenced M. de Lesseps by the result of his survey; a curious fact in Chesney's life is, that when only nine year's of age he went out in 1798 on service in the field as a sub-lieutenant of the County Down Volunteers against the United Irishmen.

Sabine from his close connection with the scientific world was able to bring forward younger officers of the Regiment for employment on scientific work and expeditions and it was in this way that Francis M. Eardley-Wilmot (No. 1773) and (Sir) J. H. Lefroy (No. 1854) with other Royal Artillery officers were employed to take magnetic observations at the Cape of Good Hope and North America respectively. Here each did good work but their chief title to Regimental fame and the gratitude of their brother officers lies in the fact that they were practically the founders of the Royal Artillery Institution. Their aims and objects are set forth in the Rules of the Institution and a short history of its formation will be found in the Preface to Vol. I. of its "Proceedings"; but whenever the benefits of the Institution are considered and discussed, the names of Eardley-Wilmot and Lefroy should be remembered.

The list of eminent men of science serving in the Royal Artillery is a long one and happily continues unbroken to the present day.

In the years 1836-38 a British Legion served in Spain to assist in the suppression of the Carlists; several Royal Artillerymen served there with distinction, notably James N. Colquhoun (No. 1427), William H. Askwith (No. 1760) and (Sir) Collingwood Dickson (No. 1874); of these General Askwith died so recently as November, 1897, having lived to finish the great work of the close of his life namely the addition to "Kane's List" of the foreign and war services of every officer in the book; these additions are included in the new edition of "Kane's List" now in the press and remain to bear testimony to the love and devotion he always felt for the Royal Regiment of Artillery.

Sir Collingwood is the youngest son of Sir Alexander Dickson and nobly sustains the reputation of his Father; at the present time the title of Master-Gunner of St. James's Park is vested in him and I hope he may be spared many years to enjoy this and all his other honours.

Colquhoun was a man of great knowledge and good taste; he had been on active service in the Peninsula from 1812 to the end of the war and from his knowledge of Spain and the Spaniards was sent in command of the Artillery of the British Legion; in 1815 he had been appointed British Commissioner to inspect and advise upon the articles in the French Musée d'Artillerie at St. Germains with a view to their restitution to former owners or division between the Allies; many articles of the British share are in the Rotunda Museum and catalogues with notes of the Commissioners on all they found are among Colquhoun's MSS. now in the Royal Artillery Institution. Colquhoun on proceeding to Spain in 1836 compiled a drill-book for Mountain Artillery; this was the first of its kind and it is surprising how slightly it differs from that of the present day and how carefully he thought out all details.

In the forties and fifties there were small expeditions and campaigns in South Africa and New Zealand; in the latter country especially several Royal Artillery officers distinguished themselves.

In 1854 war was declared against Russia by England and France and expeditionary forces from these countries landed in the Crimea in September of that year; the battle of the Alma was fought on 20th

September and was followed by those of Balaklava and Inkerman and the siege of the fortress of Sebastopol through the winter of 1854 to the 9th September, 1855. During this period an enormous force of Artillery served both in the field and trenches and, as in the case of the wars early in the century I find it possible only to mention a few of those many officers who did credit to the uniform of Plate XX.

Before reaching the Crimea the British Army had first landed at Varna in Bulgaria where the Royal Artillery was commanded by (Sir) William Cator (No. 1134) who had served at Walcheren and in the Peninsula. When he was invalided home in September, 1854, Thomas Fox Strangways (No. 1365) was appointed to succeed him, he will be remembered as decorated at Leipzig by the Crown Prince of Sweden for the services rendered there by the Rocket Brigade ; General Strangways was killed at Inkerman and was succeeded in the command of the Royal Artillery by (Sir) Richard J. Dacres (No. 1668) who retained command until peace was declared and lived to become Constable of the Tower of London and a Field Marshal, there is an excellent portrait, in oils, of him in the Royal Artillery mess, Woolwich, while of General Strangways a charming photo-process portrait hangs in the Reading room of the Royal Artillery Institution.

Early in the Crimea campaign the command of the Siege Train became the most important Artillery Command and it was held at various times by Thomas P. Flude (No. 1655), Noel T. Lake (No. 1690), (Sir) John E. Dupuis (No. 1714) and (Sir) John St. George (No. 1746).

In January, 1856, the Victoria Cross for rewarding individual acts of bravery in the field by officers or men was instituted by Royal Warrant ; its application was made retrospective to include services in the Crimea ; among those selected for this distinction, the Royal Artillery claimed a large share ; the first name thus honoured in "Kane's List" is that of (Sir) Collingwood Dickson (No. 1874) who served through the campaign from Bulgaria to the siege ; others who then received the Victoria Cross were M. C. Dixon (No. 1929), Gronow Davis (No. 2176), Bombardier Thomas Wilkinson and Gunner Thomas Arthur

At the date with which the "History of the Dress of the Royal Artillery" closed, viz. the Jubilee year 1897, many officers who had served in the Crimea were occupying posts of distinction, they were (Sir) Michael A. Biddulph (No. 2010) Black Rod, (Sir) Edwin Markham (No. 2292), Director-General of Ordnance, (Sir) Robert Biddulph (No. 2365) Governor of Gibraltar, Henry le G. Geary (No. 2438) Commanding the Belfast District.

Of officers still living in 1897, retired or unemployed, who had served in the Crimea,* there were (Sir) John M. Adye (No. 1891) who was Brigade Major and then Assistant-Adjutant-General, Royal Artillery through the campaign, (Sir) Charles d'Aguilar (No. 1911), (Sir) William J. Williams (No. 2136), (Sir) Charles W. Arbuthnot (No. 2020), since deceased, (Sir) William Stirling (No. 2366), Albert H. W. Williams (No.

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* Besides those mentioned in this and in the previous paragraph, sixty-five Artillery Officers (many of them distinguished also) who had served in the Crimea were known to be living in 1897—Secretary, R.A.I.

2249), (Sir) Henry J. Alderson (No. 2329), Frederick T. Whinyates (No. 2264) and Francis A. Whinyates (No. 2417); to the last named the Royal Artillery owes a debt of gratitude for the care and trouble with which he has edited and published in the Royal Artillery Institution " Proceedings " the letters of Swabey, Downman, and Dynely respectively and for the patience with which he has worked out the stories of Norman Ramsay at Fuentes d'Onoro and the real events of the siege of Sebastopol.

Some day, no doubt, an accurate account of the doings of the Royal Artillery in the Crimea will be published, meanwhile what is written above will serve to remind the present generation of those who wore the uniform of Plate XX.; this period cannot be passed by without mention of the fact that at the beginning of the campaign the Deputy-Adjutant-General, Royal Artillery was (Sir) Hew D. Ross (No. 890) who had commanded "A" Troop, Royal Horse Artillery, through the Peninsula and at Waterloo; as soon as the Crimean War began he was made Lieutenant-General and acting Master-General of the Ordnance and held this office until the amalgamation of the War and Ordnance Departments when he became Adjutant-General of the Royal Artillery at the Horse Guards; he was created a Field-Marshal and died in 1868 in the 90th year of his age and 74th year of his service; there is a fine life-size portrait of him in Field-Marshal's uniform in the Royal Artillery Mess, Woolwich.

The remaining Plates of the History cover a period down to 1897 in which hardly a single year has passed that has not seen the Royal Artillery on active service in the field; so many of those who took a distinguished part in these campaigns and expeditions are still serving that it is impossible to write of individuals. It was in this period that the amalgamation of the three Corps of Indian Artillery with the Royal Regiment of Artillery took place with the result that thenceforward the Royal Artillery has taken part in all the campaigns fought under the Government of India including those in China, Abyssinia and Perak. The outbreak of the Indan Mutiny in April 1857 caused a company of Royal Artillery from Ceylon to be sent to India and batteries on the way to a campaign in China to be also diverted to India so that after a lapse of just 100 years since Chalmers and his companies landed in India the Royal Artillery again began to serve in the country and in the Jubilee year, 1897, nearly one-half of all the officers of the Royal Artillery were serving in India.

Besides constant active service in India throughout the period of these last plates, the Royal Artillery has also fought in Ashanti, Zululand, Natal, Transvaal, Soudan, Egypt, China, New Zealand and Canada, and though many officers who distinguished themselves in these campaigns are dead, it must remain for a future historian to recall their deeds together with those of that goodly band who happily survive to do the Royal Artillery further credit " quo fas et gloria ducunt."

MEMOIR

OF

GENERAL SIR CHARLES GEORGE ARBUTHNOT, G.C.B.,

COLONEL COMMANDANT, ROYAL ARTILLERY.

A BARE list of the battles at which Sir Charles Arbuthnot was present might have its uses; but it would give us no notion of the character of the man who fought in these battles, nor would it explain how he reached the highest Army Commands. To form a conception of Sir Charles Arbuthnot's character, something must be known of what he did and what he said; and these facts are not easy to obtain, owing to his habitual silence about everything that might reflect credit upon himself. What was once said about another distinguished man may also be said of Sir Charles Arbuthnot:—"he took more pains to avoid fame than others do to seek it". The following meagre facts have been chiefly collected from friends and acquaintances.

Sir Charles Arbuthnot was born at Killaloe, 19th May, 1824, fourth son of the Bishop of that Diocese: he died at Richmond, Surrey, 14th April, 1899.

Before going to the Academy at Woolwich he was educated at Rugby, where he was remarkable for pluck and activity. Years afterwards, when (in spite of himself) he had made a name in the world, Mr. Tom Hughes (author of "Tom Brown's Schooldays") told Sir Alex. Arbuthnot, K.C.S.I., Sir Charles' elder brother, that he well remembered little Arbuthnot extracting the foot-ball from the densest scrimmages, and running with it until overhauled by some bigger boy. He was so small when he went to the Academy that under the present regulations he would have been rejected.

He joined the Regiment on the 17th June, 1843; was promoted 1st Captain 8th March, 1855; and landed in the Crimea in May, 1855. It was settled, for some reason, that he and his 2nd Captain (the present General Sir William Williams, K.C.B.) were to draw lots to decide which of them was to lead the spiking party in the attack on 18th June; and to carry out the arrangement Captain Williams went down to the Quarry Battery on the 17th with the present General Sir Collingwood Dickson, V.C., G.C.B. When they got there, they found that Captain Arbuthnot had just been shot through the leg. "Well, then, the matter is settled," said Colonel Dickson. But it was far from being settled. Captain Arbuthnot insisted upon drawing lots, saying, "if I win I'll be there, even should I go on a gunner's back." It appears that, wishing to look at something in the front, he had stood upon a gun, thereby exposing himself to the fire of some Russian Rifles. While upon the gun, a letter was handed to him. He stood and read; the Rifles continued their fire; at last he was hit, but went on reading until he fell from the gun into the orderly's arms.

By a series of such acts of daring, Captain Arbuthnot made a great reputation. How wide it was may be inferred from a remark made by General Sir Fenwick Williams of Kars, who never saw him under fire and judged of him only by hearsay. Some one expressed a belief that if Major Arbuthnot ever rose to high command, he would do great things, being so brave and so firm. " Firm?", exclaimed Sir Fenwick; "an Attila ! Give him an army, and he will conquer the world".

A silent, retiring man, such as Sir Charles Arbuthnot, is always liable to be misunderstood by his fellow-men. The further he stands aloof, the fewer are the facts upon which they base their judgements of him. The crowd, hurrying by, have neither the leisure nor the inclination to investigate the whole of his character: they judge him by the one or two traits he displays to them, and these are not always his best. But there is one person from whom a 1st Captain cannot possibly veil his character—his 2nd Captain. We may, therefore, accept with perfect confidence the opinion formed in the Crimea by Captain Williams of Captain Arbuthnot:—" I conceived an admiration of him that has lasted all my life . . . Arbuthnot was loyal and true and firm of purpose. He could never have sought a favour, nor his own advantage. He was incapable of doing anything mean ".

Captain Arbuthnot was twice wounded in the Crimea; was mentioned in despatches, *London Gazette*, 2nd November, 1855; and received a Medal with clasp, a brevet Majority, and 5th class of the Medjidie. He received the C.B. in 1871.

After his return from the Crimea, he was appointed to the Royal Horse Artillery in which he had not previously served; and, having been promoted regimental Lieutenant-Colonel in 1864, he went in 1868 to India, where he served until his appointment to be D.A.G. R.A. in 1880.

He commanded the Artillery of the Kandahar Field Force under General Sir Donald Stewart in '78-79, numbering some 104 guns; perhaps the largest force of British Artillery ever employed. When they returned to India he was asked how many officers he wished to recommend to notice and he replied characteristically:—" None: we have only done our duty ". Eventually, he recommended two.

In November 1879 he was appointed to command a Brigade of the Three Arms, with head-quarters at Gundamuck, and his duty was the vitally important one of keeping open the communications between the advanced portion of the Army (under Sir Fred. Roberts) and India. The force he commanded was never engaged in any great operations, but was constantly exposed to the harrassing attacks of an active and cunning enemy. Only those, probably, who have had actual experience of mountain warfare can fully appreciate what foresight, vigilance, courage and coolness are needed to cope with hardy and daring mountaineers in their own country,—" men cradled in mountain war", to quote a phrase used by Brigadier-General Arbuthnot's Brigade Major, the present Colonel James Cook, C.B., I.S.C. These were just the qualities General Arbuthnot could bring to bear, and he was (as Colonel Cook says) "at his best under fire . . . He was a man of matured plans and cool under difficulties. He shared all hardships and risks with the rest," and thus inspired general confidence. But his staff officer observed (as did everyone) that proneness to expose himself to danger which the little Rugby boy had shown at football and the Captain of Artillery in the trenches before Sebastopol. During a retirement, for instance, a flanking party on a height got hotly engaged and an officer was shot. The Brigadier-General was not satisfied until he scaled the height to the very summit, under a brisk fire, in order "to see for himself" how matters were going. Again, in the expedition to punish the Lughmanis, the rapid and dangerous river Kabul had to be crossed on inflated bullock-hides—a work that took a whole day in the full heat of the Afghan June. When the object of the expedition was accomplished and the troops began to recross the river on the rafts, the Lughmanis opened fire upon them. What happened may be told in the words of a War correspondent, Mr. Shadbolt, Barrister-at-Law ("Afghan Campaigns", historical division, 89-90):—all the troops had been got across "with the exception of sixty or seventy men and the picquets were withdrawn. Just as they were about to embark, however, the position they had hitherto held was suddenly occupied by the Lughmanis, who opened a heavy fire upon them. During the next half hour the situation of the detached party was a critical one; but General Arbuthnot eventually succeeded, by the exercise of admirable coolness and fertility of resource, in getting them across without mishap, the Brigadier himself being the last to quit the shore." Shortly afterwards General Arbuthnot was ordered to England (as D.A.G., R.A.), and Lieut.-General R. O. Bright very naturally regretted the loss of his "most valuable assistance" (Despatch to Chief of Staff, Safed Sung, 23 June, 1880). "He has been most active in the performance of his duties, and, never sparing himself, has gained the confidence of all who served under him in a remarkable degree. He is possessed of an excellent judgment, cool and collected in action, and has altogether fully maintained the reputation he has always held of being a most excellent officer." General Sir R. Bright's words about Brigadier Arbuthnot's services in Afghanistan in 1880, resemble strangely the words of General Sir Collingwood Dickson about Captain Arbuthnot's conduct in the Crimea:—"his bravery and coolness on all occasions were most conspicuous and much admired by me and all who witnessed the manner in which he performed his duties as an Artillery officer."

For his services in Afghanistan General Arbuthnot received the medal and K.C.B., and was mentioned in Despatches, *London Gazette*, 4th May, 1880.

He was Deputy Adjutant General, Royal Artillery from 1880 to 1883; Inspector General, Royal Artillery from 1883 to 1885; President, Ordnance Committee, May, 1885 to January, 1886; Commander-in-Chief in Bombay, February 1886 to December, 1886; Commander-in-Chief in Madras, December, 1886 to February, 1891.

As Commander-in-Chief of the Madras Army he was sent for a short time to Burma, 1886-8, when Sir F. Roberts returned from this country to India. The war was virtually over when he arrived there, but a vast amount of troublesome (and occassionally delicate) work remained to be done in sending out columns against the more outrageous rebels and in pacifying the others. " The winding up of the cold weather operations ", however, was " successfully carried into effect by Sir Charles Arbuthnot to the entire satisfaction of the Commander-in-Chief in India " (Despatch, A.G. in India to Indian Government, Simla, 17th May, 1887). On the 16th June, 1887, H.E. the Governor General expressed " his thorough appreciation of the valuable services rendered by Lieut.-General Sir Charles Arbuthnot " (*London Gazette*, 2nd September, 1887). Sir Charles received the Medal with clasp, and was made G.C.B. in 1894.

When he vacated the command of the Madras Army he was regretted, for he had gained what he had never sought for,—general and genuine esteem. He won confidence by his firmness and military knowledge; he won good-will by his unswerving justice. Consciously or unconsciously, he shaped his course by Sir Charles Napier's rule of '*strict* justice'. He was thus quite free from the suspicions to which misplaced lenity is always open; on the one hand, that it springs from moral weakness, and, on the other, that it is a covert canvass for popularity. Under his command there was but one road to success—the road to merit. From a stern sense of duty he blamed, without hesitation, those he thought deserving of blame. His praise, therefore, was all the more welcome and was highly valued; for those on whom it was bestowed knew well that it was sincere.

He was fearless, firm and true.

H.W.L.H.

THE TECHNICAL TRAINING OF OFFICERS
IN
GARRISON ARTILLERY.

BY

MAJOR C. P. MARTEL, R.A.

"KNOWLEDGE IS POWER."

"DUNCAN" GOLD MEDAL PRIZE ESSAY, 1899.

ALTHOUGH the elementary study of certain sciences such as Electricity, Mechanism, Chemistry etc. has been recognized for many years as forming a necessary part of the education of a Garrison Artillery Officer, still the term "technical education" has hardly as yet been adopted in the service. In civil life the definition, by Act of Parliament, of technical education commences thus :—"The expression 'technical education' shall mean instruc-
" tion in the principles of science and art applicable to industries,
" and in the application of special branches of science and art
" to specific industries and employments. It shall not include
" teaching the practice of any trade or industry or employment,
" but same as aforesaid shall include instruction in the branches
" of science and art with respect to which grants are for the
"time being made by the Department of Science and Art, etc."

Although this definition may not be much help in determining in what direction or to what extent an officer must pursue his scientific investigations, one thing is certain, it draws a line of demarcation between technical education (such as might be of use to regimental officers) and ordinary work-shop training (which is necessary for Inspectors of Ordnance Machinery, or Armament Artificers).

The work of the technical school should aim at and be limited to the teaching and illustration of principles and methods, if it goes beyond this and attempts the mechanical drilling of a student in the various processes, with a view not to attain insight into principles of work, but to gain mechanical skill and dexterity then it is trenching on the teaching of the practice of a trade.

The subjects which are usually included in a service technical course, and the application of them to Artillery purposes may be put shortly as follows :—

(a) Electricity.—Applied to position finding instruments, range dials, telephonic communications, firing gears, night sights, and an ever increasing number of purposes.

(b) Mechanism—As seen in gun mountings, gears for elevating, traversing, breech closing etc.

(c) The study of steam, gas or oil engines used in connection with hydraulic machinery and other purposes.

(d) Hydraulics applied to mountings, loading gears etc.

(e) Chemistry and heat, with reference to powders smokeless or otherwise, service explosives, or in connection with any other of the subjects enumerated, this being a science the application of which is very widely distributed.

(f) Optics, dealing with telescopes for various purposes.

(g) Metallurgy, especially in connection with those metals used in the manufacture of warlike stores.

(h) An intimate acquaintance with all the principal stores classed under the heading of " Guns ", " Carriages " and " Ammunition."

(i) Other minor subjects of less importance.

As year by year these sciences will be more and more adapted for use, in connection with our Coast Artillery, it will I think become evident that there must be two sides to the education of the Garrison Artillery officer, one "Military" and the other "Scientific". It is with the scientific side that this essay has to deal and I will endeavour to shew that it is a necessary part of our education.

If one takes a broad view of the present impetus for technical instruction, one cannot but help feeling that if some similar system were introduced into the Garrison Artillery, it would have a great influence upon schemes of defence generally, by reason of the many modernising changes which would take place if all officers were as skilled in the scientific branches of their work as they are in the military portions. But if one looks at it from a narrower standpoint, one sees how this educational problem is daily getting more important, since it is fast becoming impossible for regimental officers to take charge of all warlike stores and matériel, because the scheme of their scientific education falls short of what is required for this purpose, and the result has been that specialists have had to be introduced and are likely to go on increasing in number.

With regard to technical education we are not so far removed from civil life as to make it impossible to draw comparisons, between what has been done in this matter during the last few years among the engineering and kindred classes, and the present tendency in the service.

If one glances back at the history of " Technical Instruction " in civil life, one finds, that at first, attempts to give education to the workers, was looked upon in much the same way as technical courses are looked upon by many officers, and that one of the chief reasons why it was regarded with general distrust was, that this so-called " Technical Education " was never of a practical nature and men's minds were imbued with theoretical ideas which were of no use to them in the carrying out of their every-day work. This feeling that there is no immediately realisable value for what is taught in a technical school, pervades nearly all the letters in scientific journals, raising objections to the present system.

The same general idea is common enough in the service, we all know that most men look upon what they learn for their various examinations as of no practical use to them in future life. The object of combining scientific with practical work is discussed by Major E. S. May, R.H.A., in the commencement of his lecture on the "Study of Military History as a means of training for War" published in the "Proceedings" of the Artillery Institution for August, 1897; and although this article is on a purely military subject, yet the principle is true in all branches of life—certainly it holds good in the Garrison Artillery; no one could say that because an officer has educated himself in all the technical sciences which belong to his branch of the service, that therefore he will most likely be an indifferent regimental officer, only taking an interest in the scientific developments of the day, on the contrary, by reason of his education, his opinion should be of great value in all questions relating to the efficiency of scientific instruments or matériel generally.

The idea of Technical Education for Artillery officers is no new one for there exists a pamphlet written in 1875 by a general officer entitled "A plea for the better technical education of Artillery officers", the general idea which this officer had in mind seems to have been somewhat as follows:—"that officers should have such a sound knowledge of scientific principles and have their mind so trained in technical details as to be able not only to keep up with the times in all questions affecting matériel, but also to express such opinions as would be a guide to manufacturers in calling their attention to the real requirements of the service, and to strongly press their views upon the government, so that there should be no excuse for any falling behind hand in respect of design etc. in the matériel supplied for use with the Royal Artillery.

If any extra training was required in former years to enable officers to express such opinions, much more so will it be the case now when every day science is advancing and mechanical principles of all kinds are being introduced into designs for warlike stores, so much so that perpetual changes in the armaments must continue if we are to keep only on a level with our neighbours on the Continent. Just as Professor Tylden's words, spoken many years ago, must be recognized as having much truth in them, namely, that England would lose her industrial supremacy by virtue of the better education provided by continental nations, so also his words "that we would be outstripped by these nations in the arts of war as well as of peace" will come near the truth unless the education of Artillery Officers as a body is kept up to that standard which is necessary for them to appreciate all the advances of science in modern days. Are we falling behind in the matériel with which our field artillery is equipped, we have not been the first to take advantage of the quick-firer for field service, in adopting it we will only be copying continental nations and it will be some time yet before our field artillery gets the advantage of this advancement in matériel for field service. Now if it is necessary that the field artillery be armed with a quick-firer, and as this system is by no means a very modern one, it follows that if officers had been alive to its advantages, they would have pressed for its introduction some years ago; although this essay only deals with the training of garrison artillery officers, yet I mention this as it shews the importance of educating officers so that they may be able to discuss the advantages or otherwise of new or proposed eguipment; and here one sees the use of a technical school which would give officers an opportunity of studying the latest scientific devices, point out what is being done at home and abroad in the way of improving the equipment for all branches of the Artillery and would educate officers up to modern ideas—mechanical combinations which formerly were looked upon as of a complicated nature are now thought simple in the extreme and applied to numerous service purposes; the advantages to be gained from modern inventions should not be thrown away because at first sight they appear and are stigmatised as "complicated"—B.L. guns must have appeared very complicated, compared to R.M.L. when first introduced, but these latter had to give way in front of the advantages of the later invention. The familiarity of modern mechanism which would be gained as a result of technical education would cause a revulsion of ideas as to what may justly be considered "complicated".

Are officers of the garrison artillery satisfied now with the armament supplied to their branch of the service, if not they must be prepared to shew, in what direction the improvement lies and also that the scientific reasons on which their arguments are based are worthy of consideration. I do not see how one can ever rest satisfied, because any arrangement which as a whole is made up of mechanical, electrical, and other devices must be capable of improvement as time goes on, only if one has not got the technical knowledge to combine with ones everyday work, how can one point out that the application of some new scientific discovery would be of increased advantage to the system with which one has to deal, or suggest any slight improvement if one knows not the principle upon which the mechanism is based, or even compare our own armaments with those of continental nations.

The opinions of all regimental officers, not alone of those specially trained and in special employment should be extremely valuable in all questions of change in matériel, provided always that their technical knowledge is of a sufficiently high standard; much good can result from criticism, from argument, and from a greater interest being taken in matériel. Of late years much attention has been paid to drill and fire discipline, regular systems have been worked out, and due to the School of Gunnery have permeated through the service. Not only those who go through the long course, but every officer is prepared to criticise the principles on which the drill and fire discipline rest and has his own ideas as to alterations and improvements. We frequently see letters and essays on the subject of the Drill and Training of the Garrison Artillery, which shews that these subjects are thought about and discussed. What we want is a similar school for leading officers to think on technical subjects, keeping them posted up in all the latest developments and getting officers to understand that on themselves chiefly depends whether their armament is as efficient as it should be or not. If officers had only a higher scientific knowledge, the suggestions they would offer would soon be acted upon in the manufacturing departments, and we should have many simplifications and much improvement in our scientific instruments. The regimental officer whose daily work is connected with coast defence is best qualified to say where alterations or additions are necessary, if only he be sufficiently progressive; this is an age in which things scientific cannot stand fast for a moment, but still I consider that educated to the right standard he is in the position to make the best use of his knowledge, and being acquainted with the practical application of the question he is the less likely to fall into that error of making a machine, which though theoretically perfect, yet does not satisfy the practical requirements of the artilleryman.

The course which is considered necessary for a Gunnery Lieutenant of the Royal Navy might now be compared with some of those which are open to Royal Artillery officers. The duties of a Gunnery Lieutenant approach somewhat to those of a Gunnery Instructor in the Royal Artillery, as far as one can liken work afloat to work on shore, and one would therefore expect both courses to be to some extent similar, but one finds that the Naval course is from a scientific point of view far in advance of the corresponding course with us—it is in fact a combination of our "Long Course" and "Senior Class".* In the Naval course in addition to the work in connection with drill and training some considerable time is spent over the study of matériel, and officers are expected to be thoroughly up-to-date in scientific developments as applied to armaments and to have some idea as to how we stand in this matter in comparison with other countries. At the same time the theoretical study of such subjects as mechanics electricity, chemistry etc. is not neglected, eight months being devoted to this portion of the course, sufficient to give officers a grounding in the elements of these sciences and to be a help to them in appreciating and understanding the numerous complicated pieces of machinery which form part of any modern armament. This grounding can then be developed, if necessary in after years. The period under instruction in the Navy is about two years, while in our Long Course it is for one, out of which only three months are devoted to technical subjects and the study of matériel. The differences mentioned above in the educaton of those whose duty it is to instruct others in all the latest developments, whether of drill or of warlike stores, must cause a contrast between the two services which regard to the importance in which "Matériel" and the sciences is held.

That some importance is attached to this subject of technical instruction is apparent in looking through the list of books printed at Government expense and circulated for the benefit of officers etc.

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* Also known as the "Advanced Class."

There are no less than seventeen treatises and manuals on various technical subjects and many of them large works containing a vast amount of information in material generally and in scientific subjects But with the exception of those who are going or have been through courses the contents of these books is matter of little interest to officers of the Garrison Artillery, for the reason that they have not been forced to keep up the groundwork of that technical knowledge which they learnt at the Royal Military Academy and without it the books are uninteresting and heavy reading.

Granted that technical education is necessary for the officers of a scientific branch of the service like the Garrison Artillery then for purposes of instruction officers can be divided up into two main classes, those who elect to take appointments in the manufacturing departments, inspection staff of the Army Ordnance Department or in similar branches of the service; and those who prefer to remain for most of their service as purely regimental officers. With regard to the first class, little need be said, they are nearly all men who have passed through the senior or firemasters* course, or else have shewn that they possess special qualifications for this kind of work, they are in fact men with considerable technical training. The education provided by these courses is necessarily limited by the time allowed, only main principles can as a rule be attempted and an officer after taking up an appointment will still have much to learn, but he should have a foundation on which to work and without which he would be incapable of expressing opinions likely to be respected by scientific men. With regard to the regimental officer I have already endeavoured to point out that from the general standpoint of "pure education" it must be an advantage in all classes of life to have to deal with scientifically trained men, and an especial advantage to the State in the case of its Garrison Artillery officers, whose duty it is to take the lead and point the road which improvements in warlike stores must follow. In addition to this, other reasons of a more regimental nature can be given, why Artillery Officers should be technically trained. What are the objections raised to Courses of Instruction for Regimental officers?

It may be as well to state some of them at once.

Firstly—It is said that the first duty of a regimental officer is to his men; to attend to their drill, training and instruction of the company, study discipline, interior economy and so on, and if he carries out these duties properly, it is as much as can be expected of him.

Secondly—If they are given a course of instruction in Electricity, Steam, Hydraulics, care and preservation of mountings, guns etc., they would soon forget all about it, because they would never make any practical use of their knowledge, there being specialists of all kinds told off to do this work.

Thirdly—For fear of doing damage, or for fear of causing friction with some other department, no officer will interfere with any portion of the armament or endeavour to repair a damage if he can possibly avoid it. I propose now to dispose of these objections *seriatim*, shewing at the same time what advantage would accrue from the training of regimental officers.

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* Now called Ordnance Course.

The first objection is a question as to whether an officer can combine the scientific knowledge which he is to acquire with the regimental duty which he is already doing and do it better than before—very possibly all cannot, but there will be some, very likely the majority, who will so benefit by a course of instruction that a new world of thought will be opened before them, and they will be disposed to investigate the reason of everything which they see working around them.

As has been advanced in favor of technical education in civil life "it teaches men to understand some of those phenomena and laws of nature which ordinarily lie hidden just beneath the surface of things most common to them." This will not detract from a man's capacity for military duties in any way, but enable him to combine with them such knowledge as would lead him to offer suggestions for the simplification of the systems of drill and fire discipline. In future wars in which Garrison Artillery may be called upon to take part, superiority of weapons, seems even more likely than ever to produce momentous results and by weapons in this case is meant not only the gun itself, but also the mounting, ammunition, and the numerous scientific devices which are employed to make each gun part of a combined system, very powerful so long as each link in the chain is doing its proper work, but much less so when through any failure in matériel or design, a break-down occurs—should not every Garrisos Artillery officer be well acquainted with the principles upon which the smooth working in each link of the chain depends, whether it is an electrical appliance as in a telephone or firing circuit, or a mechanical combination as in a breech mechanism, or some principle of hydraulics as in a buffer of a mounting etc., etc.

The second and third objections are closely connected, they open up the whole question of the "Advisability or otherwise of employing specialists."

To my mind the mere employment of specialists points to the fact that we recognise the inability of the ordinary company officer to do the necessary work connected with Garrison Artillery Armaments. These specialists belong to two branches of the service. Firstly—to the Army Ordnance Corps, amongst whom are the Inspectors of Ordnance Machinery and the Armament artificers, a most important body of men, for on them devolves the duty of keeping the armaments in a state of efficiency. Secondly—To the Regimental Establishment of the Garrison Artillery which includes among the Officers, Gunnery Instructors, Inspectors of Range Finding etc., and among the men, gunners, as Layers, Range Finders, Machinists etc. Those who are highly skilled mechanics like the Inspector of Ordnance Machinery and his assistants the armament artificers, are necessarily limited in number, and even in time of peace they are fully occupied in carrying out the necessary inspections and examinations in their districts. What would happen in time of war? Their work in time of peace is necessary for the keeping up of the armament in a proper state of efficiency, it is not mere ornamental work which could be dispensed with—one can easily conceive a case when they would be quite unable to keep pace with the work—supposing that only part of the district had been engaged, numerous small repairs would be necessary, for we have some idea of the damage to matériel that would be caused by a hail of Q.F. shells, also after firing a number of rounds, many mountings etc. might require careful examination and parts replacing or adjusting; meanwhile the rest of the district must be kept in a most efficient state, even more so than in peace time. At home, drill would probably be carried on daily by Militia and Volunteers, all of which would give increased work and necessitate much supervision of the armament, or supposing some new work had to be undertaken, while a state of war existed, a new mounting put up for example, this would require the personal superintendance of the I.O.M. for a week at least and would employ several of the armament artificers; meanwhile the ordinary work must fall behindhand—it would be impossible for the I.O.M. to see to everything himself, great responsibility must be thrown on the armament artificers, would the result be satisfactory? Should these N.C. officers be placed in such a position? Would it not be much better for the regimental officers or at any rate a certain proportion of them to be so trained as to be capable in case of necessity of doing work similar to that of the I.O.M., these officers could then at any moment be called upon to examine the armament and with the assistance of the artificers rectify any defect. Should a casualty occur amongst these specialists, which would be only natural, then a trained officer might by making use of the machinery gunners be of great value in surmounting some difficulty of the moment when these men's undirected efforts would probably be of little avail. Again take the case of a boiler and engine employed in connection with the armament, are they to be dependent on a few specialists? Why should not all regimental officers understand the principles of stoking, the working of the engines, and even have some idea of repairs. There must be many officers in the Garrison Artillery who are capable of profiting by a thoroughly good training both in theoretical and practical branches of mechanics etc. but when trained, the second objection which I have mentioned must be overcome by encouraging them in every way to keep up their knowledge by being present when the I.O.M. is inspecting or carrying out repairs etc. and whenever the slightest breakdown occurs or a defect is developed they might be called upon to state what they consider the proper remedy, in this way they would be able to apply their theoretical knowledge and gain practical experience. These officers must be company officers, what is wanted are men who can combine their regimental knowledge with a fair share of scientific or mechanical training, men to fall back on in case of need. Some people advocate the abolition of the specialist altogether, urging that those who work the armament should also look after it and be responsible for its care and preservation; although there may be much advantage in this, it can hardly be possible with so much machinery etc. as in use at the present day, occasionally high mechanical skill will be required and an officer cannot be expected to attain to this, in a short time. There must be someone to fall back on or refer to in case of need, and we must have a corps of mechanics to carry out this work, but to rely in time of war on one or two specialists keeping the whole of the armament in an efficient state seems to be running an unnecessary risk. To overcome objection three, the regimental officer should at practice be supreme, if any gear breaks down of whatsoever nature, he should remedy the defect to the best of his ability, in case of need he can call to his assistance the armament artificer who might be present as he is now, and who would gain as much experience in seeing the attempted remedies of others as if he did the work himself. Under existing conditions the regimental officer considers that he will be held responsible for any damage he does if he attempts to interfere with the armament; he may say that in time of war he would not hesitate to adjust gear, repair electrical appliances, but could he do it, he has little scientific training to help him, and has gained no experience in times of peace, if he does damage in gaining experience, the State should pay for it, as the State gets the benefit of his experience, but there is no danger of such a thing occurring with any officer who brings to bear in each case the principles which he would be taught at any technical school. On the peace establishments of the Garrison Artillery the following specialists as regard armament work are shown:—Armament Majors, Armament Captains, Captains for district duties, Lieutenants for district duties, Gunnery Instructors, and Inspectors of Range Finding. At Malta these total up to 15 and at Gibraltar to 24, although at present there are not officers selected for all the appointments. By giving an increased training to company officers, all these specialists could be abolished—in this way company officers, who in the course of time would all be men with a fair amount of training, would be able to take entire charge of the armament with which they work. If we argue that very specially trained officers are necessary to look after Range and Position Finders, Telephonic Communications etc., in time of peace, then we are in the same position in time of war as with other specialists, owing to extra work and numbers reduced by casualties they will not be able to carry out their duties effectively and in most cases there will be nobody to fall back on, for the ordinary regimental officer will not have considered it necessary to keep up his electrical knowledge and other scientific acquirements. There seems to be no objection to some slight amount of specialising in the company itself so long as officers are not allowed to fall into grooves; one subaltern may be more fitted to look after delicate instruments or electrical appliances than another, then let one take charge of such instruments, if there are any in the district, and let another interest himself chiefly in mountings etc. and so on, and with regard to a gunnery instructor it should be possible to have in each company one officer who has been specially trained, by going through the Long Course or some similar course of instruction. In this way with a little extra training, many of the disadvantages of having a number of regimental specialists acting independently in a district would be done away with and all the work in the sub-district would be concentrated under the officer commanding the company who would be in charge of it in time of peace and fight it in time of war.

How are the regimental officers to be instructed in technical subjects so that they may take the place of these regimental specialists and be capable if ncessary of supplementing the work done by the I.O.M.? Several ways present themselves:—

(1.) The course of instruction at the Royal Military Academy might be extended and the last six months devoted entirely to technical subjects such as are considered necessary for a Garrison Artillery Officer.

(2.) The instruction might be given in districts.

(3.) A new branch of the School of Gunnery might be started, which would deal entirely with matériel.

(4.) Lastly, this work might be undertaken by a special Institution like the Ordnance College.

The first point to deal with is whether the instruction shall be given before the officer joins a service battery or after he has attained a few years service. I have no hesitation in saying that the latter is the proper course to pursue, turning again to the conditions of civil life the general opinion as far as I can gather with regard to young men entering various branches of engineering and kindred trades is—"that if all the school work is done first, then when the young man enters his shop work, he thinks he knows everything and offends workmen who have been working at the subject for years and who could teach him much." He ought to do elementary school work first, then a shop course, then go back to complete his school training for when he goes back to school, he can appreciate why he is learning what is put to him. Applying the general principle of this idea to ourselves, the elementary school training is that given at the Royal Military Academy, the shop work is the training in a service company and the second school course, is that which is proposed to be given at some special Institution. The argument seems sound, let the young officer get a good general course of military education coupled with necessary elements of science, as a cadet, and then join a service company in order that he may learn what work in the Garrison Artillery means, what conditions he should fulfil as a Garrison Artillery officer, and then give him an opportunity of completing his technical education which he will now be able to do with profit both to himself and to the country. With regard to the first method proposed, I see no advantages beyond economy and that of a false kind: I have already stated why a "post graduate" course should be instituted, moreover, I think that it is safe to assert that cadets at the Royal Military Academy do not realise the importance of the work they are doing, their eyes are turned to the purely military side of their profession and in the first few years of their service they seldom give a thought to the principles and theories of the technical subjects which they have been taught—then when the novelty wears off and the peace soldiering becomes a little tame and monotonous, interest in the technical portion of their profession should be awakened; in a few cases this is a voluntary action on the part of the individual, such men join the Senior and other classes, but in most cases the start must be made compulsory. There are many men who are unaware of the capabilities which lie within them until they join some course of instruction, men who shewed no mathematical ability at the academy have been known to develop mathematical talents of no mean order when obliged to take up the subject as part of a course, and what applies to mathematics applies equally well to other subjects.

If the second method was adopted an officer in each district must be selected as an Instructor; supposing that the Instructor in Gunnery is retained as a specialist for this purpose, then the instruction which he at present receives in the "Long Course" would have to be supplemented very considerably as he would be expected to be an authority on many technical subjects, in fact he would have to pass through the senior class as well as the long course—then again there would be the danger of his considering the technical instruction as secondary to the gunnery or *vice versâ*; there would be great difficulty in forming a class of officers of any size in a district for any continuous instruction as they would have at the same time to be doing regimental duty with their companies. Lecture rooms with plans, models, chemical and electrical apparatus etc. would be necessary, which would entail great expense, and then again it would be very difficult to ensure a similar training in each district, however good the superintendance of the whole might be. The armament varies so at different stations that unless guns and mountings were provided for instructional purposes, some officers, as far as modern appliances are concerned would benefit little by the course. At a few stations only could instruction be provided in the care of engines, boilers, practice in stoking etc. The cost of carrying out this system is likely to be considerable, but there is one great advantage namely "that officers would not be taken away from their stations and so in many ways lose touch with their companies."

Method 3.—There may be some advantage of combining different branches of educational work under one head, but there are many disadvantages, one branch is sure to be put forward at the expense of another and centralisation can be carried to too great an extent. The School of Gunnery is already a large institution and is now established in various parts of the country, if it takes up such a subject as technical training, it must if it wants to be thorough, keep the subject distinct from ordinary drill, this means a separate staff and would be in fact a combination of the Ordnance College and the School of Gunnery; if only the regimental officer had to be considered this might be the proper thing to do, but as long as officers have to be trained for special work such as the Inspection Staff, Army Ordnance and manufacturing departments, a separate institution with every modern appliance is necessary. It might be claimed for teaching technical subjects at such stations as Shoeburyness, Golden Hill or Plymouth, that the practical application can be shewn in a battery, and that the imagination has to supply nothing, in combining the theoretical portion of the subject with its practical application, this may seem a good deal to some but to anyone who has taken an ordinary interest in the armament in his station, the application of general principles should not be a source of difficulty. These latter remarks appear to be the only practical gain of this system and against this must be put the expense of two separate technical schools, one the Ordnance College for the higher training of men selected for appointments, and another for the instruction of regimental officers generally.

Method 4. Seeing that there is a necessity for a separate institution at Woolwich to teach technical subjects, the simplest solution of the question is to form courses for regimental officers at this School of Instruction. The Ordnance College is already provided with well equipped chemical and electrical laboratories has the advantage of being able to make use of all the material in the Arsenal, not only in connection with guns, carriages and ammunition; but with engines, boilers, machinery, electric light etc. etc.; technical instruction is its main object and that in the fullest sense of the term. By giving the training to all officers at the same place, a systematic course, including all the latest ideas, could be provided for, and a fixed standard worked up to.

Supposing that every officer of the Garrison Artillery is put through a course in technical subjects after not less than two years service how many will have to be struck off duty annually for this purpose. It appears that about thirty-five to forty officers are added to the Garrison Artillery yearly. From this total must be deducted those officers who go through such courses as the "Senior" or "Ordnance" without going through the regimental course, probably all that would be left would be thirty to thirty-five ; a very small number. The length of the course should be six months, longer if possible. When one comes to consider what the teaching of technical subjects means, how closely connected they are, the one to another, how for example in the teaching of electricity, some knowledge of chemistry, heat etc. is necessary, and so on with other subjects, and then that the application of all these subjects, chemistry, electricity, heat, steam, mechanism etc. has to be considered with reference to the various service purposes such as range finding instruments, communications, mountings, ammunition, firing gears etc. etc. one sees the uselessness of a course of less duration than six months. At the end of the course an officer should be allowed to spend a short time, from a fortnight to a month in studying that subject with which he is especially connected in his own company. For example an officer whose charge included range finding instruments might work for a few weeks with the Inspector of Range Finding, Woolwich, and so on. The proposition is that every officer in the Garrison Artillery, some time after two years service, shall go through a six months course at a service technical college. At first sight it would appear as if this would necessitate the withdrawal of many service officers from their companies for a long period of time, but I do not think this is so; for first of all there are only some thirty officers to be put through annually, that is, with two courses, fifteen in each; these fifteen would have to be drawn from home companies or those near home, such as the Channel Islands, Malta or Gibraltar. With reference to this question of the withdrawal of officers the following points must be considered:—

(a) The period of the Long Course at Woolwich could be shortened by two months, if the officers had previously been through a regimental course.

(b) The special class could be abolished, which at present absorbs from eight to twelve officers annually.

(c) The position finding class would be amalgamated with the regimental course, which saves another six to twelve men.

(d) If there were no regimental specialists there would be more company officers to draw upon.

Six months out of the period during which an officer is a Lieutenant or Captain say some eighteen years, is all that is required for the technical course, and another six months would provide for a good gunnery course for Garrison Artillery officers. On looking at the Regimental list, it appears that a great many officers go through a course of some kind, some have gone through two or three ; the training proposed would therefore not amount to any great increase in the time to be spent on courses.

What is sought for is a scheme which would ensure a systematic course of technical training ; at present one officer is instructed in electricity, another in steam and hydraulics, and so on, the result being that each officer, works as it were only in a small circle and cannot take that broad view of the sciences which is necessary, if his knowledge is to be of any use.

All officers would be equally well trained and capable of understanding the principles upon which scientific instruments are based, and not only would they feel, that with regard to the matériel in their charge, they were no longer in the hands of a few specialists, but they would take an interest in discovering defects and imperfections and suggesting improvements which would eventually lead to vastly improved systems of defence. Again I do not think that there would be any scarcity of officers for the higher education as given in the Senior Class if all had been made to keep up their knowledge to a moderate standard—it is when officers have forgotten everything which they were taught as Cadets that they hesitate to plunge into the whole subject again.

Are other countries alive to the advantages of education generally? I do not think there is any doubt about this, taking Germany as an example, all her great commercial advancement during the past few years is generally ascribed to her systematic technical teaching—undoubtedly the same spirit must be felt and recognized in the army and it would be well to see whether we in the service are keeping pace with these modern principles or whether we are inclined to lag behind as has clearly been the case with that portion of our civilian element, which goes to make up the great body of men in trade and commerce and who are now suffering by loss of influence in the commercial world from their neglect of that education which we are too fond of looking upon as only fit for school boys and theorists.

It is not so easy to compare the system of education of one country with that of another, as it would seem at first sight. Unless one is in the country or has spent some time there and conversed with those who have studied the subject, one is dependent on short written descriptions and various syllabuses of instruction. Now a syllabus should be a very good guide but I do not think it is, because it can be so easily worded as to lead one to believe that the course of Instruction to which it refers fulfils conditions, or supplies a demand for knowledge which in reality it does not, it gives one little idea of the standard to which a class is expected to attain.

To one point I would especially draw attention. In foreign technical schools it is customary for the students to investigate subjects which can be of use to the manufacturers of the country, for example supposing that there was any difficulty in obtaining a fast dye of any particular colour, then those students who were well versed in chemistry would be told off to find a remedy and in this way part of the money paid to keep up the schools returns in the form of commercial successes. The same principle could be applied in the case of a service technical school in this country,there are always many subjects requiring investigation which by being referred to advanced students is such classes as the " Senior " would serve to give renewed interest in their work and be a saving in expense to the country.

I have already mentioned Germany as alive to the necessity of education, let us see as far as possible what she is doing to instruct her officers especially those of the Foot Artillery. In Germany, candidates for commissions first pass an educational test, this would correspond to our entrance examination for Woolwich or Sandhurst. After six months service, with a regiment, nearly all officers must pass through a War School, the only exception are those who have been highly educated either at a University, high class *technical* school, or in the " Selecta " class of cadets, this course would correspond to our course at Woolwich or Sandhurst, but in addition to the above, Artillery officers, after at least one year and nine month's service have to pass a special course which is of a decidedly technical nature and lasts for 9½ months, after which four weeks are spent at a school of gunnery; those who pass highest in the course can then be selected, to continue their technical education and become fitted for special appointments. It is this technical instruction which is wanting in our service. It may be said that it is combined with the military course at the Academy, but the great disadvantage of such a system is, that the officer (cadet in this case) can bring no professional knowledge to bear on his instruction during the course, while in the German service at least one year and nine months is given in which to gain a general idea of the requirements of the Artillery service before commencing the technical course; and further the German system recognizes the fact that selection is necessary for those men who are to be highly trained, the majority can only be taught up to a certain point, beyond that a few must be chosen, and the method adopted seems a good one because those officers wishing to be selected will work hard during the first part of the course and will therefore be in a fit condition to receive further and higher instruction. So far only the regimental officer has been mentioned, when we come to certain special classes such as correspond to our Ordnance or Senior Class, we find the course far more thorough than anything we can shew, three years is the length of time allowed and every advantage appears to be given to the students to acquire knowledge; they should therefore be educated up to a standard far surpassing anything in this country. Another country which is fully alive to the advantages of education is the United States of America. With regard to the training of its officers, the system followed in that country is as follows:—

Cadets are admitted to the United States Academy on passing a qualifying examination, which is of an elementary character but when once admitted they are subjected to a course extending over four years and of a very severe nature; among the technical subjects taught are, mechanics, astronomy, sound, light, chemistry, heat, electricity, magnetism, mineralogy, geology, ordnance, explosives etc and judging by the marks obtained the work must be of a very high order. After the four years of study, cadets are appointed to the various arms or corps, those passing highest on the list are recommended for commissions in the Engineers, Ordnance and Artillery; Cavalry and Infantry coming in last. In addition to the Academy which is at West Point, there is an Artillery School at Fort Monroe. It is intended that every Artillery officer shall attend this school at least once before promotion to the rank of Captain. The subjects which are taught are (1) Artillery, (2) Ballistics, (3) Engineering, (4) Steam and Mechanism, (5) Electricity and Mines, (6) Chemistry and Explosives, (7) Military Science, (8) Practical Military Exercises; also photography, telegraphy and cordage, all these are technical subjects except Nos. 3, 7, and 8; 3 includes fortification, 7, strategy and tactics, and 8 is drill, practice, fire discipline, such subjects in fact as our long course officers are taught at Shoeburyness. Looking at the syllabus of instruction there can be no doubt but that all these subjects are gone into very thoroughly. Here then is a course for regimental officers which comprises military and technical subjects, it is similar to that which could be obtained by adding on to the School of Gunnery a technical department, and this is the arrangement which I stated would be best, if regimental officers only had to be considered. The length of the course is two years which seems unnecessarily long even when military subjects are included and such a length no doubt is not practicable in this country; but the fact remains that the Americans recognize the value of educating their Artillery officers to a very high standard. Officers have to pass in all the subjects mentioned above, during the two years in which they are under instruction, but those who take honours at the examinations are permitted to spend two more years at the school on condition that they specialise in one or more subjects. Here again is the principle of educating the mass up to a certain point but then selecting the few for the higher education. It is clear then that both the United States of America and Germany consider a good technical education of some value to their Artillery officers, and there can be no doubt but that the people of both countries are "practical" in spite of the interest they take in *theoretical* instruction. With regard to other countries, France, Russia, Italy, for example, as far as I can ascertain, a system somewhat similar to our own is employed with this difference that the instruction given to cadets or officers at the commencement of their service, is extended over a longer period than with us. For example in France and Italy two years are spent at the " Ecole Polytechnique " and then immediately following after that two years at the " Ecole d'application " this of course is a more thorough training than we give to our Artillery officers. In France at any rate, if not also in Italy, there are at various head-quarters, model rooms, laboratories, and so on, where it is intended that officers shall work and keep up the technical knowledge acquired at the " school of application ". In Russia there is an Institution very similar to our Ordnance College, but as with us, it is intended for special classes, although a large number of officers appear to be put through. It seems therefore that with regard to this subject of Technical Instruction, we are certainly not in advance of most other countries, and that we are behindhand in comparison with those who give a post graduate course to their officers and with countries like France and Italy, who in addition to a two years course corresponding to that which our cadets undergo, send their young officers for two years more to the " Ecole d'application." What class of instruction should be provided for a regimental course? There will be the same difficulty in settling this question as there is with regard to the same point in civil life. In the many articles which are written on the subject of Technical education, in science journals, one repeatedly comes across the suggestion, that the class of instruction afforded is not what is required and consequently no useful results follow and it is laid to the charge of this faulty system that technical education does not " pay " from a commercial point of view and does not yield results commensurate with its expense. Although there are many who find fault with the existing conditions, yet there appear to be very few who are prepared with any scheme for their improvement. This is frequently the case, it is easy to find fault, but not so easy to find a remedy. These letters of criticism however, serve one good purpose, they enable one to foresee the dangers which one must steer clear of, in instituting any similar system of technical education in the future, and as they are general in their application I mention them here:—

(1). Too much must not be attempted, it is useless to soar too high and produce a commodity for which there is a scanty demand. Many men with an intimate knowledge of the Integral Calculus and theories on all things visible and invisible are not required, what are wanted are men well grounded in all the important elements of science and technology.

(2). The Instructor in a technical school is not the man most fitted as a rule to teach " Workshop methods " if these are necessary they should be learnt in the workshop, his work is to teach "root principles" which should underlie all methods now and always.

(3). Results must not be judged from " examinations " for if they are, then the instructor's time and energy are wasted in cramming students for the purpose of obtaining marks, in order that the appearance of a high standard of efficiency may be kept up.

(4). There must be no stint of practical and theoretical appliances in the school.

(5). It must be remembered that education is only the accumulation of stores, the bricks and mortar in fact, on the initiative skill of the student, on his constructive power depends whether he can make any use of the materials collected. In any scheme for introducing technical education into the service, the teaching of the sciences with a view to their application to military purposes only, must be guarded against. Time must be spent in acquiring a good fundamental knowledge of each subject, this is a drudgery which cannot be avoided, the application follows as a matter of course.

It would be useless to give here a detailed syllabus for a six months course of instruction for regimental officers; many of the subjects mentioned at the commencement of this essay would have to be touched on, over some, much time would have to be spent, while others could be dismissed in a few lectures. It would be very important to distinguish between those subjects which are likely in the future to play an ever increasing part in connection with the appliances used in coast defence, and those whose *rôle* is decreasing day by day—among the former would be electricity, the application of which to service stores would have to be dealt with thoroughly, if all regimental officers are in future years to be capable of carrying out the duties now performed by trained specialists. The inspection, care and preservation of all warlike stores, whether they come under the heading of guns, carriages, ammunition or instruments, should be understood by all officers, so much of the various sciences should be taught as would enable officers to do this and also to draw right conclusions from accidents or any other peculiar circumstances which come under their notice, and so frame reports which can be of service to others.

No more need be said with regard to the details of the syllabus. The instruction must be sufficiently general to avoid the reproach of being formed for one particular purpose, or to bring to the front one particular subject, and it must be sufficiently practical to be of use to officers in their daily work; general principles must also be taught as well as practical methods.

AMMUNITION COLUMNS
FOR
MOUNTAIN OR IRREGULAR WARFARE.*

BY

CAPTAIN G. F. MAC MUNN, *D.S.O.*, R.A.

ALL Mountain Gunners will welcome Major H. C. C. D. Simpson's paper on "Ammunition Columns for Mountain or Irregular Warfare", as drawing attention to a matter which has long called for organization and legislation.

Ammunition columns are units which are very easily extemporised by energetic officers and staff, given that the establishments and equipment are ready tabulated, and that equipment, cattle and *personnel* are available. Once the necessary tables are in existence, it only remains to assign the *personnel*, and draw the equipment and cattle from the departments concerned, who will receive orders to issue; forty-eight hours should then suffice to have the column in good working order. If therefore Major Simpson's proposals lead to the settlement and authorization of the necessary establishment and issue of tables, with provisions of equipment in the mobilization stores, the question will have been satisfactorily settled.

Major Simpson dwells on the constant and varied nature of operations in Africa, in both mountain and jungle country, and evidently wishes for an Ammunition Column Organization, suitable or adaptable to employment in such operations; I therefore venture to think that his tables are not perhaps of sufficiently an elastic nature, to suit the motto "Ubique", and would suggest an organization which would allow of columns being formed to suit any combination of arms, and which would allow of any complete unit being easily detached, which so often happens in irregular warfare, when forces are divided up and bifurcate.

Again in some countries mules are available, in others, bullocks etc. while in others, two-wheeled carts can go anywhere and have double the carrying capacity that their draught animals would have under pack.

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* Being notes on a paper by Major H. C. C. D. Simpson, bearing the same title published in "Proceedings" R.A.I., Vol. XXVI, No. 4.

I should suggest therefore, tables that show transport required for each unit likely to accompany a force of the nature under discussion, and which have columns side by side showing alternative kinds of transport.

It often happens as in the Tirah Campaign that it is desirable to keep the infantry and artillery ammunition supplies separate, in which case the tables would allow of the ammunition column being equipped complete and then detached as desired.

I give an outlined table of a column to carry a similar number of rounds as Major Simpson's Tables, omitting details of *personnel* which only come in after the main principles are decided on.

No. 1. Summary of Pack or light Transport for Ammunition Column for Force made up of any Proportion of Specified Units.

Nature of Loads.	No. of Animals required for Ammunition and Stores of Units as Specified.																				
	Head Quarters of column (stores etc) 1			Add for each Mountain Battery. 2			For each Squadron. 3			For each Section R.E. 4			For each Battalion Infantry. 5			For each Machine gun. 6			For each Company of Mounted Infant'y 7		
	Mules.	Camels.	2-Mule Carts.	Mules.	Camels.	2-Mule Carts.	Mules.	Camels.	2-Mule Carts.	Mules.	Camels.	2-Mule Carts.	Mules.	Camels.	2-Mule Carts.	Mules	Camels.	2-Mule Carts.	Mules.	Camels.	2-Mule Carts.
Ammunition or Stores of Head-quarter Section ...	16	...	...	18	...	...	2	...	...	1	...	...	31	...	...	4	...	...	3	...	...
Water and Cooking untensils...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kits, N.C.O.'s and men ...	1	...	...	1	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...
Spare	3	...	...	3	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...
Total.	25	...	...	22	...	...	2	...	...	1	...	...	36	...	...	4	...	...	3	...	...

NOTE.—A Mule means any animal of similar pace and carrying capacity, and of course a cart may be drawn with two horses or two jennets or two donkeys.

The table is only completed for pack-mule transport.

Thus for a Brigade of all arms, of strength contemplated by Major Simpson's—the ammunition column would be :—

1. Unit (No. 1.) .... = 25 mules.
1. „ (No. 2.) .... = 22 „
1. „ (No. 3.) .... = 2 „
1. „ (No. 4.) .... = 1 „
4. „ (No. 5.) .... = 144 „
4. „ (No. 6.) .... = 16 „

Total = 210 mules

and the strength of a column for a force of any composition could be similarly calculated.

No. 1. table would be accompanied by tables of *personnel* and equipment similarly arranged.

The tables could be enlarged to show reserve ammunition needed for departmental units, but this is so small that it may be omitted.

Tables adapted on this method would be equally serviceable for Ammunition Parks and should hold equally good in India as elsewhere.

In India, Ammunition Parks have a tabulated establishment for mobilization, but not so ammunition columns for hill warfare On the other hand, Ammunition Columns for service where wheels can go, are kept up and partially manned and horsed.

India is at present the home of the mountain gunner and officers of that branch will be well content if Major Simpson's proposals bear fruit, which as they involve no recurring peace expenditure, they well may do. The present 50% reserve carried by a mountain battery really belongs to the battery ammunition, which without it, is below the usual supply per gun. This battery reserve and its transport however forms an excellent link between the battery and the column. After Dargai, the Brigade Division reserve ammunition mules, massed into temporary columns for the Tirah Campaign, came back by night to the park at Shinawari to replenish and constantly did so during the campaign ; but a more complete organization is wanted for any larger operations.

I have ventured to roughly supplement Major Simpson's proposals with the less hesitation that he has expressly asked officers to do so.

THE TACTICAL EMPLOYMENT OF THE AMMUNITION WAGONS OF ARTILLERY ARMED WITH QUICK-FIRING GUNS, SPECIALLY THOSE OF HORSE ARTILLERY ACTING WITH CAVALRY.

BY

MAJOR J. W. STIRLING, R.H.A.

THE question referred to by Major N. E. Young in the discussion of Lieut.-Colonel Elmslie's Lecture "Some Experiences in Egypt", (*vide* "Proceedings" of the Royal Artillery Institution, February, 1899) relative to the tactical employment of wagons with Horse Artillery, can hardly be left where it is, for the instructions as to Ammunition Supply in Field Artillery Drill, Chapter I., Section 18 were issued before the question of quick-firing guns came into prominence, and the solution adopted by Major Young himself cannot be accepted as a general principle, although no doubt it answered well where there was no possibility of being opposed by a hostile artillery.

The introduction of quick-firing field guns lends a special interest to the problem at the present time, and whatever the ultimate general arrangements may be for increased artillery ammunition supply, the first step would appear to be the addition of three ammunition wagons to all batteries. This has already been accepted as a necessity on the Continent and the extra rounds thus carried are surely in a far more advantageous position for all practical purposes, than if in charge of a column however mobile, which has first to establish its connection with the guns to say nothing of other difficulties so liable to arise before the ammunition supply becomes effective. The object of the present article being to consider the tactical employment of the wagons of Batteries armed with quick-firing guns, it is beside the mark to discuss whether the addition of three wagons per Battery forms a sufficient extra supply for an Artillery armed with quick-firing guns, though in view of the facts brought to notice in Lieutenant Atkinson's interesting paper* in the April number of the "Proceedings" of the Royal Artillery Institution, it is quite possible that it may be so; and we may now pass to the tactical details.

No special difficulty seems to arise in the normal employment of Field Artillery, or of Horse Artillery acting as Corps Artillery, for our admirable system of wagon supply, (Field Artillery Drill, Chapter IV, Section 9.) lends itself readily to the slight modifications required by the addition of a third echelon of wagons; and I venture to express an opinion, based, as regards the French Artillery, on personal observation, that we have nothing to learn in this respect from our continental neighbours. It is however when we come to consider the ammunition supply of Horse Artillery employed with Cavalry that we have to deal with conditions which require the closest examination in order to arrive at a system which will meet the requirements of the complex situation, and secure ample supply without exposing our wagons to unnecessary risks or demanding from the Cavalry a multiplication of escorts.

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* "Artillery Ammunition Supply," by Lieutenant B. Atkinson, R.H.A., published in "Proceedings" R.A.I., Vol. XXVI. No. 4.

The first point to be considered is:—Does a Horse Battery, armed with quick-firing guns, acting with Cavalry, require more ammunition than is available in the present "Limber Supply" system, which amounts to fifty rounds per gun in the 12-pr., 6-cwt. Horse Artillery gun, a number, which from consideration of weight is not likely to be exceeded in any quick-firing equipment. It may be argued that the moments during which a cavalry target is under fire are so fleeting that this amount is sufficient; but, on the other hand, if the moments are fleeting the rate of fire must be rapid, and as the time under fire is not affected by the nature of the gun, the number of rounds fired will be increased four-fold. By a reference to the School of Gunnery report on the practice of Field and Horse Artillery, 1898, it will be seen that ten to twelve rounds a minute per Battery, or two rounds per gun, is the most which can be counted on with magazine fire and case, while the Krupp gun, 7·5 centimetre, Model 1897, claims to fire eight aimed rounds per gun per minute; now it is in a Cavalry and Horse Artillery action, that the most rapid development of fire may be expected, surely therefore, here if anywhere, we must provide for a maximum; or to look at the question in another aspect; in a cavalry action, the limbers would be exhausted in six minutes of rapid fire, and though it is not pretended that every engagement would afford such a splendid opportunity for fire, yet, if a few rounds had been expended in a preliminary action, followed by three minutes of continued fire against Cavalry, the limbers would be so depleted that the Battery Commander, starting in pursuit, would be in a false position, or in the case of reverse, the Cavalry Commander, relying on the guns as a *point d'appui* might be bitterly disappointed at finding them wanting at the critical moment through lack of ammunition.

The next question is:—Do the expedients given in the Field Artillery Drill, Chapter I., Section 18, meet the necessities of the case? Granted that the Captain has a Napoleonic faculty for watching the tactical situation, (allowed to be of the most difficult and rapidly changing character) and anticipating a move, will be able to start his wagon limbers so as to arrive at the guns in time to advance with them? and should he do so, is it a sound tactical action to leave the wagon bodies a mile in rear without teams? Again would the wagon teams which have made this rapid movement be in a condition to advance with the guns? I submit that the only answer to these questions is a decided negative. If this is so, the case is made out, which requires the presence of wagons in a Horse Battery acting with Cavalry, and it only remains to discuss the best plan of getting them there.

As Cavalry escorts are not available for successive echelons of wagons, it is evident that each of these must be, either in such close contact with the guns, as to be protected by their fire effect or escort, or else beyond the immediate sphere of the Cavalry action, the position which is assigned to them under the present regulations. In the French Artillery, a battery going into action is accompanied by three wagons, and on the command "action" the wagon halts in rear of its gun, the limber forming in rear of the wagon, the teams however do not unhook unless the order is given for the limbers and teams to take cover. The disadvantage of this system compared to our wagon supply is the enormous target presented, but this would not be felt in a cavalry fight, for that is not an occasion for seeking Artillery Targets, and indeed a Horse Battery at limber supply is already such an excellent object that slight additions may be ignored. A modification of this arrangement appears to me to meet our case.

Assuming that a Horse Battery armed with quick-firing guns will consist of six guns and nine wagons, the latter would be divided into three echelons, the first of which under a Sergeant as echelon leader, would accompany the guns, the remaining two echelons being retained by the Captain assisted by the Quarter-Master-Sergeant and Farrier for relief purposes, but in the first instance at any rate, kept beyond the immediate sphere of the cavalry action, and employed under the same general instructions which now obtain. The 1st echelon should follow the guns at a distance of 50 to 100 yards and conform to their movement, but when the guns move in a Battery column these wagons should form line at half interval to avoid adding depth to the column, each wagon would be accompanied by 1 Non-commissioned officer and 1 mounted gunner, whose horses in action would be held by the wagon drivers, the men performing the duties of ammunition carriers to the section. No gunners should be mounted on the limbers of the echelon accompanying the gun, as mobility is all important. On the battery coming into action these wagons would form as laid down for wagon supply except that those of the flank sections should cover the inner guns, to facilitate the preparation for a cavalry attack on a flank, the teams would be unhooked, and reversing to the right, would form in rear of the limbers and detachments, which in the meantime would have wheeled about and covered their guns four yards in rear of the line of wagons. Should the Battery Commander find that he is exposed to Artillery fire, or for any reason the normal condition of the Cavalry fight is modified, he can give the order "Limbers and teams take cover" when the usual wagon supply position would be taken up under the superintendence of the echelon leader; the original formation being resumed on the command "Limbers and teams take post." In throwing back a defensive flank when in action, the limber detachments and wagon teams of 2, 4 and 5 sub-divisions move to the protected sides of their wagons, the limbers and detachments of 3 and 6 into line with them, but those of No. 1 incline to the left and form close to No. 2 wagon to give room for No. 1 gun to be run back and protect their flank.

The detachments of a section should be arranged into two of seven numbers, exclusive of the two wagon numbers; the accompanying sketch shews the position of the centre section in action, and it will be seen that even with detachments averaging eight numbers per sub-division, provision is made for holding the Section Commander's horse as well as the echelon leader's, and in the flank sections a horse holder is available for the Sergeant-Major's or other horse if required. If ten numbers per sub-division are available, the two extra numbers should be with the other six wagons, available to replace casualties or to accompany the relief echelons.

By the addition of three wagons we secure a total of 188 rounds per gun, but a proportionate increase of establishment is entailed, which I estimate as under:—

1 Sergeant as Echelon leader (this would be the Non-commissioned officer under training for Quarter-Master Sergeant.)
6 Gunners (Limber gunners and spare.)
10 Drivers (one spare.)
20 Draught horses (two spare.)
13 Riding horses, to provide for Echelon Leader and ten numbers in detachment, should this number not be already available.

If however, wagons are to be effectively used on service, training must be provided for in peace; the facility with which the wagons of a Horse Battery in India drop into their places, forms a strong contrast to what is not unfrequently seen at Home, when on a special occasion a wagon supply is improvised, and if a satisfactory training for a battery is expected, at least one wagon per section should be added to the peace establishment of every battery at home.

In conclusion it is submitted that by the present proposal, effective and ample ammunition supply is secured, viz. 96 rounds actually with each gun, and a reserve of 18 draught horses are placed under the hand of the Battery Commander, who is in a position either to hold his own or to advance with full limbers, and this result is obtained without loss of mobility, or additional call on the Cavalry for escort, the only disadvantage being that a larger target is presented, but this again is discounted by the ruling principle that the cavalry and not the guns are the target in a cavalry fight.

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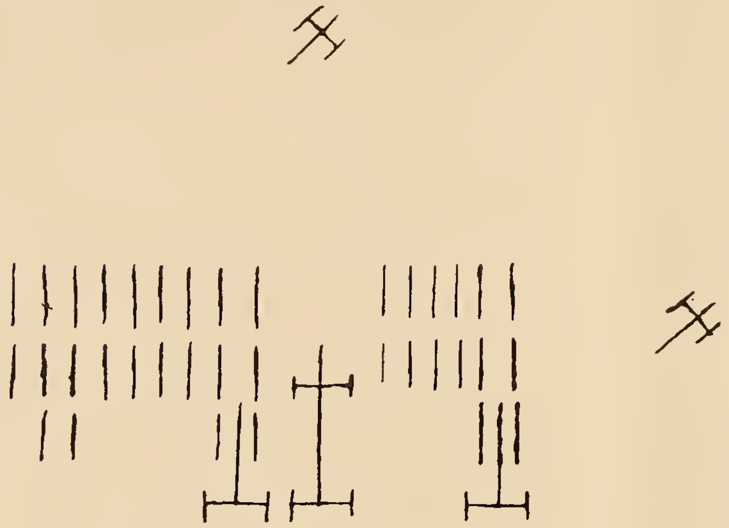
SKETCH to accompany Paper by Major J. W. Stirling, R.H.A., on

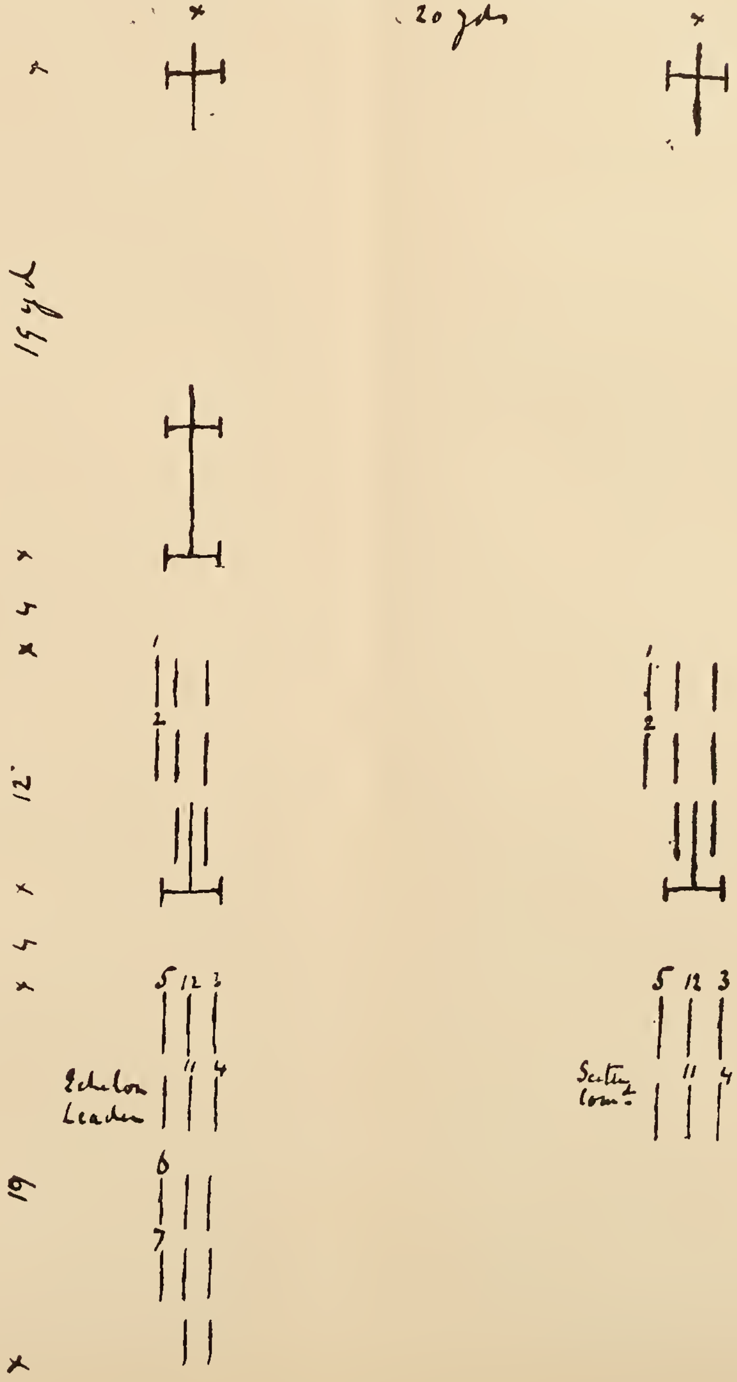
"THE TACTICAL EMPLOYMENT OF THE AMMUNITION WAGONS OF ARTILLERY ARMED WITH QUICK-FIRING GUNS, ESPECIALLY THOSE OF HORSE ARTILLERY ACTING WITH CAVALRY."

Issued with the "Proceedings" R.A.I., Vol. XXVI., No. 8.

Right Section - Cavalry on the Right -



Centre Section in Action



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PATENT OFFICE

THE MILITARY FORCES OF QUEENSLAND.

BY

CAPTAIN A. T. ANDERSON, R.A.

IN these days of awakened interest in the question of Federation and in the various schemes for the organized military defence of the Empire, it is much to be regretted that so little is known at home of those Colonial Forces, which are not included in the strength of the Imperial Army, but which, if we take the combined strength of Canada, South Africa and Australasia, form a supplementary army—on paper at least—of nearly 70,000 men. Even in the service the number of officers who have any definite knowledge on the subject is, I imagine, comparatively small. This is the more to be regretted, as there can be no doubt that it would be a great help to the various officers engaged in the organisation and the training of these forces to feel that their efforts were appreciated at home, and that an intelligent interest was taken in the results.

Of late years many of us in the Regiment have had the opportunity of meeting with different officers of the Australian Artillery, who have been sent by their Governments from time to time to join the ‘Long Course” at Shoeburyness. It is to be hoped that this excellent system will be long continued, not only for the advantages which doubtless accrue to the officers themselves, but also because officers in the Regiment are naturally led by their intercourse with the Australian Gunners to take a greater interest in the forces of which the latter are the representatives. Those officers who have had the privilege of this intercourse are of course aware that there is a Force of Regular Artillery in Australia, but I know that there are still many others, who imagine that the Colonial troops are solely composed of Volunteers with a small sprinkling of Militia. It is with the object of removing these misconceptions, and sketching briefly how the defence system is worked in one of the Colonies, which may be taken as fairly typical of the others, that I have put together the following notes made by me during a short visit to Queensland on my way home from India this year.

I was fortunate enough to arrive in Brisbane at the time of the annual camp of continuous training which is held at Lytton, a place at the mouth of the river about twelve miles from Brisbane; this camp is attended by the Defence Force proper, which consists of Field and Garrison Artillery, Mounted Infantry, Infantry, and Medical Staff Corps, and also by the Volunteers and Cadets. The camp lasts for six days, and the number of men under canvas this year reached a total of nearly two thousand; this, however, does not represent the whole strength of the force, as smaller camps are also held annually at Townsville and Rockhampton, for the benefit of those troops whose districts are too remote to allow of their attending the larger one at Lytton. The Regular troops take no part in the training of this camp, all the men being employed in fatigues, and as staff servants during the week; it is their duty also to lay out the camp and to strike it at the conclusion of the operations; they have their own separate camps at other times during the year.

Through the kindness of Colonel Gunter, the Commandant, I was attached to the force for the week as Assistant Artillery Staff Officer, and consequently had an excellent opportunity of seeing how the training was carried on. I witnessed the manœuvring of the Mounted Infantry under Colonel Ricards, and also had the privilege of assisting as umpire at the Field Firing of the Moreton Regiment; the men were keen and soldierlike, the former regiment being well mounted, and of course extremely good horsemen, and the work generally seemed remarkably good, considering the infinitesimal amount of training they can get during the year. But it was of course in the work of the Field Artillery that I took most interest. They carried out their competitive practice according to the rules obtaining at home, with a few modifications introduced by Major Byron, the Artillery Staff Officer, to make the conditions more suitable for the special circumstances. Major Byron, who also acted as Chief Umpire, will be remembered by many officers in the Regiment, as having taken part in the Long Course of 1891, in the final examination of which he took the first place.

The Field Artillery consists of two four-gun batteries, one armed with 12-prs., and the other with 9-prs.; the smartness, in drill and turn out, attained to by both of them can only be explained by the extreme keenness of the men themselves who can show such good results on the, at best, somewhat fragmentary training which is all that the Government will allow them. The first series for both the batteries was from the nature of the ground exceedngly difficult, and the light was so bad that it was very hard to pick up the target with the naked eye. Owing to this, and also to the fact that the layers of the 12-pr. battery were not highly trained, as indeed it was impossible that they should be, in the use of the telescopic sights, the damage done to the targets at this series was quite inconsiderable; at the other two series, 58 out of the 90 dummies were hit in the case of the 12-pr. battery, the number of rounds fired being 18 and 16 respectively; with th 9-pr. battery, 44 dummies were hit and the number of rounds was 13 and 21. It would be hardly fair to compare this with the practice made by Royal Artillery batteries, but when the following points are taken into consideration, I think that it will be admitted that these results are most creditable to all concerned. The Queensland Government only allows the Defence Force fourteen days' training during the year, including the six days taken up by the annual camp; and up to this limit each man receives pay according to the number of day's work he puts in; they can, and many do, put in more drills than this allowance, but, if so, they receive no extra pay for it. There is also an allowance given to cover the expenses of uniform. The Volunteers, as at home, get no pay, but they receive a capitation allowance. The six days of the camp, while they of course form an indispensable portion of the training, are not so much a time of instruction as an occasion for putting into practice the teaching received during the year. There remain, therefore, eight days made up of scattered hours distributed through the twelve months, in which officers and men whether of the Artillery or Infantry, are expected to acquire a sufficient knowledge of their different branches, to be able to offer an efficient resistance to any invading force which may be landed in the Colony. To say this is merely another way of stating that there is still somewhat left to be desired in the efficiency of the Force, but the wonder is that with all the disadvantages so much excellent work is done. Fortunately the unremitting labours of the Staff in their endeavours to make bricks without straw are backed up by a zeal and ardour among the officers and men of the force which are beyond all praise. As an instance of this keenness I may state the fact that, when a few years ago the Government for reasons of economy withdrew the annual camp allowance, the Force turned out and did four days' continuous training at their own expense.

As I have said, each man is allowed fourteen days' training by Government, that is to say, he is given pay for fourteen days' work at the rate of 8/- a day, or about the ordinary wages of a working man, if he has attended a sufficent number of days to make up that time, eight hours' work being reckoned as one day. In order to qualify for efficiency he must have done eighty hours of drill, of which at least three days must have been spent at the annual camp. To enable men to fulfil these conditions, or to exceed them if they wish, evening parades are held twice a week during the drill season, and afternoon parades about once a fortnight, making a total of about eighty evening and twenty daylight parades during the year. As a matter of fact it almost invariably happens that a man does a great deal more work than is necessary to qualify him for his fourteen days' pay, and it is evident that that parsimonious spirit which might lead some men to do just sufficient drill to secure their pay, and no more, is quite unknown to the Force.

I found the proof of this in looking through one of the efficiency returns selected quite at random; it was a report on one of the Field Batteries, and I found that amongst them all, officers, non-commissioned officers and men, there was only one man who could be said to have steered at all close to the wind in this respect; all the rest had done just about double the number of drills required by the regulations, or in other words, had given their services free to Government for some fourteen days. The one solitary exception had indeed exceeded his fourteen days' drill, though only by a narrow margin, but that he too had not done much more than this was due to his compulsory absence during four months of the year.

While I was in camp, I took the opportunity of visiting Lytton Fort, a strong work supplied with modern armament including quick-firing guns, which commands the entrance to the Brisbane River; it is in the charge of the Regular Artillery, and it was here that the Militia Garrison Battery carried out their practice during the camp. The method of fighting the fort, adopted in the Force, is the system of coast defence invented by Major-General G. A. French, R.A., with a few modifications; this is probably known to many officers, and to give a detailed account of it would be beyond the province of this article; it will be sufficient if I state briefly the chief advantages that are claimed, and I think with justice, for the system.

1. The elimination of the Gun Group Commander's prediction.
2. Should the front of the target be obscured by smoke, the system at once slides insensibly into a Position Finding system, as simple as the Depression Range Finder, and as accurate as the Watkin method.
3. The plant required is very inexpensive.

In support of this last point I may mention that Major Byron has had all the necessary plant built in the battery workshops; and of the accuracy of every detail the excellent practice made by the Garrison battery this year, was sufficient proof.

My remarks so far have dealt almost entirely with the Militia portion of the troops. The Permanent Force of Queensland consists of one battery of Garrison Artillery called the "A. Battery," with a proportion of horses for the purposes of instruction in mounted and battery drill. It is under the command of Major Byron. There is also usually an officer of the Royal Artillery attached to it. Lieutenant E. H. Willis, R.A., at present holds the billet, but he was away on duty at the time I write of. The strength on the 1st June, 1898, was 134 men. The standard of height and chest measurement is very high; and as regards physique, I have certainly never seen a finer body of men; they are taken from a higher class than is the average soldier in the Imperial army, most of them know some trade, and they are all intelligent men of good character; crime is, in fact, practically unknown in the battery.

And it is just as well that they are above the average in intelligence, as the amount of things they have to do and to know would tax an ordinary man's power to the utmost. In addition to a Garrison Battery's legitimate work in looking after the defences, &c., there is one permanent section of Field Artillery maintained, the twelve drivers of which have to be found from the total strength given above; moreover, the submarine mining arrangements form part of the duties of this most universal of batteries, and the following quotation from the Defence Force Regulations will show the amount of knowledge which the Government expects from the higher ranks:—

"Although A. Battery is organised as a battery of Artillery and must "at all times be thoroughly efficient thereas, the Officers and Non-"Commissioned Officers, will be expected to be able to instruct mem-"bers of other branches of the Defence Force. Those attached special-

"ly to the mounted branches of the A. Battery must be available for "affording instruction to Field Artillery, Mounted Infantry, and other "Mounted Corps."

And though there are so many and so varied duties to be performed, it must not be supposed that the work is scamped on that account. I did not personally see anything of the submarine mining work, but I had a look at the programme for drill and instruction, which had been drawn up in that connection by Major Byron, and which appeared to me, so far as my limited knowledge on the subject enabled me to judge, to be most full and comprehensive. As regards the permanent section, the horses were in good condition, and the drivers in a high state of efficiency: in the driving competition at the annual tournament their team did two clear drives out of three, and in the third they only shaved one post.

It is unfortunate that the men are only enlisted for three years, as they have to leave just as they have become thoroughly efficient soldiers; our service rules would perhaps be hardly suitable, but it is open to question whether it would not be an improvement to increase the period of service from three to five years; the additional two years would hardly affect the question of subsequent employment, and it is unnecessary to dwell on the great value of the extra knowledge and experience which would be gained therein.

Numerically, the battery is not nearly as strong as it should be, and it labours under a very serious disadvantage in the number of detachments which it has to supply, some at a great distance from headquarters; the result is that it is impossible to get together more than about fifty men on parade. This was the biggest muster that I had a chance of seeing, and though, as I have stated, they were as smart and as fine a set of men as one could wish to see, this only made it the more regrettable that such splendid possibilities should be to a great extent rendered abortive by the penny-wise policy of the Government in keeping down to such narrow limits the strength of a force on which their very existence may some day depend.

In fact, to the impartial observer, the attitude of the Government towards its military defenders appears somewhat strange. It is easy, and therefore perhaps unfair, to criticize a policy which *may* be rendered necessary in a young colony by considerations of economy, but one would suppose that, granted the necessity of maintaining a force at all, it would be worth while to devote sufficient funds to keep that force absolutely efficient. I don't think that the firmest supporter of the Queensland Government could argue that this is done at present. To take one item only, the harness of the Field Artillery is in a very poor state; things are condemned from year to year in the ordinary way, but as no notice ever seems to be taken of the proceedings of the condemnation committee, matters are not bettered thereby, and, meanwhile the harness is becoming more and more unserviceable; and as with this, so with other things. As the expense of the Force only amounts at present to about 2/6 per head of the population, as opposed to 20/-, which is approximately the cost per head in Great Britain, it cannot be urged that any very ruinous call is made on the country by the military authorities, and it is hard to avoid the conclusion that the Government have up-to-date treated the matter rather as a military show, which has to be kept up for the sake of appearances, than as a serious necessity.

If there is one thing that would seem to be absolutely certain, it is this, that Queensland, in common with the other Colonies of Australasia, will some day, and who can guess how soon, have to resist a foreign invader, and their political leaders seem hardly to realize that there is one essential difference between their case and that of the Mother Country. The latter will, most likely, fight her decisive battles in other countries, but when Australia has to fight, the struggle will be on her own shores. Fortunately the present Premier of Queensland seems to possess a just appreciation of the military necessities of his Colony, if we may judge from the speech on his future programme, which he delivered at a recent meeting, and as there has been no outcry with reference to his proposals for future expenditure, it may be hoped that the public are also taking a sound view of the matter. Indeed, the Defence Force seems to have a great future before it and there are not wanting indications that the time is now approaching when the " Sons of Australia " will, in the words of one of their finest poets, " take to war as their fathers took to sport." Federation is at present the topic of the hour, and even if nothing else comes of the idea it at least seems probable that the forces of the different Colonies will be amalgamated, and that the Artillery will be formed into one regiment under the name of the " Royal Australian Artillery."

In conclusion, I would recommend any officers who may find themselves on leave in Queensland to pay a visit to the head-quarters of the force in Brisbane. I can assure them of a hospitable reception, and I have no doubt that on the conclusion of their visit they will carry away with them, as I have done, a very lively rememberance of the kindness and hospitality of the Queensland Officers.

THE TECHNICAL TRAINING OF OFFICERS

IN

GARRISON ARTILLERY.

BY

CAPTAIN C. G. VEREKER, R.A

"LIVE AND LEARN."

"DUNCAN" COMMENDED ESSAY, 1899.

ON consideration of the heading of this Essay, we are at once confronted by three main questions requiring answers, viz.:—

I. What may be required of Garrison Artillery Officers.
II. What training is necessary to enable them to carry out their work efficiently?
III. How is this training to be obtained?

We propose to divide the subject under these three heads and to examine each question separately.

CHAPTER I.

WHAT MAY BE REQUIRED OF GARRISON ARTILLERY OFFICERS?

The expression "Garrison Artillery," though usually taken as synonymous with Coast Artillery, embraces three classes of service, Coast Defence, Fortress Defence and Siege Work, distinct from one another, yet blending together in such a manner that it is difficult to say where one ends and the other begins.

An officer's career may be connected with all or any of these, and he may be called upon to serve in every variety of station and climate; in an Indian inland town armed only with smooth-bores, or in a modern coast fortress provided with all the latest productions of science; with siege trains and heavy batteries, or in command of Maxim or quick-firing guns; and his training must be on sufficiently broad lines to enable him to readily adapt himself to the exigencies of the service.

All training being with a view to preparation for war, it is necessary to first enquire, what are the ways in which this country is likely to be engaged in active operations, and what will be the work required of Garrison Artillery in each case. These may be broadly divided into four classes:—

A. War with a lesser power or small expeditions.
B. Purely naval war without probability of invasion at home.
C. Purely naval war, with probability of invasion at home.
D. Non-maritime war, or attack of enemy's country after command of the sea has been gained.

A. In this, Coast Artillery would take little or no part. It might, however, often be necessary to send a few siege guns or howitzers to the front, for which purpose, part of the movable armament from one of our stations abroad, or perhaps one or more siege train companies from home or India would be taken. Garrison Artillery might also be required to provide batteries of Maxim or Mountain guns, ammunition columns, or other details.

Our officers at all stations abroad, where movable armament is kept, must be prepared for this work and our siege train companies should be highly trained and ready for any emergency.

B. This is the most probable case. Our enemies, though not strong enough to invade this country, might make things very unpleasant for us, by attacking our commerce and destroying our coal stores and arsenals.

Coast Artillery then becomes all important and intimately connected with the welfare of our Navy.

We find the general opinion to be that in this case the attack of our ports and coaling stations by light and fast craft, torpedo-boats or otherwise, for the purpose of destroying shipping, etc. under the protection of our guns, is likely to play a very prominent part; that in some cases, but very rarely, the enemy's ships may try and run past defences for some definite purpose; that actual bombardments will not often be had recourse to, unless the enemy have command of the sea, and that then, as has almost always been the case in the past, the ships will merely keep the sea front of a fortress occupied, while the works are being attacked in rear by landing parties, or by troops disembarked some way off, as was done at Santiago last year. As a maritime power we are exposed to any of these forms of attack, but more especially to torpedo-boat raids, shortly after, or in some cases even before, the declaration of war is known, and little or no time will be available for drill. We should then be in a constant state of readiness in all matters appertaining to coast defence, and our officers should be prepared to resist any form of attack from the sea, and at stations abroad, from the land side also.

The importance of this land defence of coast fortresses seems to be hardly realised, and there is an idea that it would never be necessary unless our Navy was completely destroyed; but it is not difficult to imagine a temporary reverse in distant seas, in which case the enemy might possibly effect a landing, and either capture or destroy some of our coaling stations, before reinforcements could be sent to their relief. This point is very clearly brought forward by Major E. G. Nicolls, in the Prize Essay for 1895; he rightly urges its recognition and the better training required by all concerned, in the methods of fighting guns of the movable armament.

Our siege train companies at home, not being required as such, would have to assist in fighting the sea front guns, and must therefore have a sufficient knowledge of the work to take their place in the less important groups for the protection of mine fields and defence against raid.

C. This case is similar to B., but as the enemy must have gained complete command of the sea, the chances of attack from the land, for the capture of our outlying stations would be increased, while raids would be less probable, as their object could be equally well attained without running the risk of a repulse.

The defence of our home fortresses from the land side would become our chief object and the siege train companies would have to take charge of the movable armament and be reinforced by all the Coast Artillery that could be spared, the latter's place being filled up by Militia and Volunteers. Coast Artillery must therefore have a good knowledge of the land front defence of our important fortresses.

D. This case might present itself at short notice in India; our siege train companies and heavy batteries there, should be kept ready for any emergency, and the Garrison Artillery at stations inland should have such a knowledge of siege work as will enable them to at once take up their duties in attack and defence of strong places.

At home, however, before we were called upon to use our siege train against modern fortifications, a certain time would necessarily have to elapse, while our Navy was gaining command of the sea, our army being mobilized, and our advanced troops or allies establishing themselves on the enemy's territory. This would give us time to complete the training of our men before they were required for active operations. Garrison Artillery not being required for Coast Defence could be formed into siege trains, the regular siege companies and officers who had lately been through a course at Lydd, being available to instruct others and to take up the more important duties.

All Coast Artillery should therefore have sufficient knowledge of siege work, to allow of a very short training making them into efficient siege artillerymen.

Officers might also be called upon to serve with ammunition columns and parks, or with batteries of machine guns as in the first case mentioned, and should have some idea of ammunition supply in the field and of the general working of the three arms.

Considerations of these four cases leads us to the following conclusions:—

1. That this empire is at any time exposed to attacks by ships against our various coast fortresses, and that the majority of officers of Garrison Artillery must make a special study of coast defence, especially against raids by torpedo-boats, &c.
2. That a good knowledge of the defence of land fronts is necessary to all.
3. That we require a small number of highly trained siege artillerymen ready for any emergency.

4. That all officers should have a sufficient knowledge of siege work, to enable them to take their place in the siege train with a very little extra training.

CHAPTER II.

WHAT TRAINING IS NECESSARY TO ENABLE THEM TO CARRY OUT THEIR WORK EFFICIENTLY ?

In the foregoing chapter we have tried to show the various kinds of service that Garrison Artillery may be called upon to perform, and mentioned generally what would be required of officers in each case. Ought we to expect all to be equally well up in each class of work, or should there be any difference in the training of coast and siege artillery officers?

We think there should be a difference.

In our present day of high technical knowledge, everyone becomes more or less a specialist if he wishes to thoroughly master his particular work, and the more science enters into modern warfare, the more is this bound to be the case. The time when a man could be equally good as a Horse, Field, Mountain, Coast defence or Siege Artilleryman, besides being an infantryman or cavalryman on occasion, is past. The introduction of intricate mechanisms, delicate observing instruments, and above all of tactics which were previously almost non-existent, has made coast defence a separate science of war, requiring specially trained and able officers; while siege artillery has of late years been greatly improved, and the introduction of breech-loading howitzers will necessitate a higher standard of training on the part of all concerned. There are also differences in the characteristics which officers should possess.

A Coast Artilleryman should be particularly quick of action and decision, able to adapt himself to all conditions, trained to independence and self-reliance. He should have a knowledge of the sea and of ships, and a turn for mechanism. He should be more practical than theoretical in his ideas, and above all, smart and clear headed, for " imagine an officer in command of a work defending a channel against an enemy's squadron coming up at full speed. That officer would need to be possessed of a promptitude of decision and a quickness and energy in acting, to which there would be no parallel on field service."*

The Siege Artilleryman on the other hand should do his work deliberately and quietly, on a well considered and carefully thought out plan. He should be a good mathematician, understand modern fortification and the construction of batteries, be particularly well up in gunnery and ballistics, and have a general knowledge of the working of the other arms in attack and defence.

We think therefore, that officers should, as far as possible, be kept to the particular branch of Garrison Artillery to which they are best suited, and that their training should consist of two parts; a general training in subjects common to both coast and siege work, and a special training in one or the other, this latter to be on sufficiently broad lines to enable them to adapt themselves to the requirements of the service.

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* Report of Committee on Organization, 1888.

The following subjects putting aside mathematics, military topography, field tactics, fortification and law, which are more or less common to all army officers, should form part of their general technical training, and most of them should be taught before an officer obtains his commission:—

1. Electricity.—The importance of which especially in Coast Defence, cannot be overrated. Its application is becoming more general every year in the direction, ranging and firing of guns, in the working of search-lights and the lighting of magazines and batteries.
2. Chemistry.—A thorough knowledge of explosives being necessary.
3. Steam.—Which, though not so important as it promised to be a few years ago, is nevertheless used in many ways and a clear understanding of the elements of which is required to enable officers to follow local explanations of its use in working guns, machinery, dynamos, etc.
4. Hydraulics and Hydro-pneumatics.—Which are applied in some form or other to every mounting of modern construction, both in Coast and Siege Artillery, and in many other ways, as in jacks, lifts, etc.
5. Mechanism.—Which is most essential to a good understanding of every class of mounting and machinery used in the service.
6. Artillery generally.—Including gunnery and ballistics, ammunition and military carriages.
7. Employment of Artillery.—In the field, in sieges and in coast defence.
8. Fortress Defence.—By which we understand the defence of land fronts by fire from rifles, machine guns, field guns, light armament and howitzers.

A Coast Artillery officer should also possess special knowledge of the following:—

1. The general working of guns against every form of attack from the sea likely to take place, and the best tactical methods of meeting such attacks.
2. The ships of foreign navies, their capabilities, speed and power of resistance against projectiles; the general evolutions likely to be performed by a squadron when attacking coast forts, and the different ways in which torpedo-boat raids may be carried out.
3. The position of mine-fields and their use in defence, the forms of countermining that might be employed, and the working of search-lights.
4. The various methods of finding and passing ranges, and the

system of signalling between forts and of communicating with ships.

5. The supply of ammunition.
6. Mounting and dismounting guns and carriages of every description.
7. The mechanical details of all forms of mounting; how they should be repaired in case of emergency; what makeshifts could be used if damaged in action.

He should also have a good general knowledge of siege work.

A Siege Artillery officer should receive special training in:—

1. The employment of siege artillery in the attack and defence of fortresses.
2. Construction of siege batteries and permanent works and the effect of fire against every form of protection.
3. The ranging of siege guns and observation of fire.
4. The supply of ammunition in a siege.
5. Laying platforms, arming siege batteries by day and night, entraining and detraining, moving, mounting and dismounting siege guns.
6. The mechanical details of all siege mountings, repairs and makeshifts.

He should also have a good general knowledge of Coast Defence.

When examining the work required of officers in the last chapter, we arrived at the conclusion that the majority should be most highly trained in Coast Defence. We will then take this as our standard and enquire into the best method of obtaining the necessary technical knowledge, leaving siege artillery till the end of this paper.

It is clear that a thorough acquaintance with the subjects enumerated, cannot be obtained in a day, and that no amount of book study will ever make an efficient Coast Artilleryman, but that years of practical experience, occasionally supplemented by courses of instruction, will alone enable an officer to obtain a fair knowledge of his work. "There is obviously no maximum limit to what we desire, . . . he cannot possibly possess too much general knowledge or too many technical requirements."*

It takes an officer all his time to keep pace with the constant changes and improvements which are taking place, but if once he has obtained a good grounding in his work, it should be easy for him to remain efficient and to adapt himself to the various stations to which he may be sent, increasing his knowledge as opportunity offers. But for this it is essential that he should be keen and proud of his regiment and work from the very first, that he should have no hankering to escape from it on the earliest opportunity into other branches, and that his labours should be adequately requited. This can never be the case as matters stand at present, when young officers join with the hope of eventually getting a field battery, and their seniors are constantly changing, while those who remain, get tired of exerting themselves in instructing others in their work and making good officers of them, only to lose them as soon as a vacancy in the mounted branch occurs.

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* R.A.I. "Proceedings," Vol. XXII., No. 7, "The training together in Peace Time the Garrison Artillery Forces of the Empire, including Regular, Militia, Volunteer and Colonial Artillery." By Colonel A. W. White, R.A.

In support of this contention we may quote the following opinions:—

"Young officers, . . . and I lay stress on this, should be posted direct to the branches with which they are intended to serve." [*]

"If there is a separation at all, it must mean separation *ab initio* . . . from the very beginning." [†]

"What is wanted is that the officer should from the beginning of his career, be imbued with the idea that he is entering a coast defence service, and that the study and practice of coast defence is to be his profession." [‡]

Above all things the senior officers should have risen to their position in the Garrison Artillery and should know their work thoroughly. A Lieut.-Colonel for example, who would be a Fire Commander in time of war, must have done the work in the lower ranks for a proper appreciation of what can be expected of his juniors. Nothing is more disheartening to officers who know their work, than to have a man put over them who has perhaps served all his time in other branches and knows nothing, nor ever can thoroughly know anything of the interior working of our most intricate system of defence.

CHAPTER III.

HOW IS THIS TRAINING TO BE OBTAINED ?

We will now examine what means we at present have of imparting the necessary technical knowledge, see if it is all that can be desired, and suggest possible improvement. For this purpose we will divide the subject under five heads:—

A. Training at Royal Military Academy.
B. Young officers on first appointment.
C. Junior officers.
D. Officers generally.
E. Courses of instruction and specialists.

A. *Training at Royal Military Academy.*

This is a most important part of the training of a Garrison Artillery officer, and is the foundation of all future work, the thorough grounding he receives as a cadet should last him throughout his service. Unfortunately, however, the circumstances are such that a cadet, from the first day he joins, gets imbued with ideas greatly to the disadvantage of Garrison Artillery. He sees horse and field batteries, but never gets the chance of knowing what a smart Garrison company can do. His drills all tend to make him compare the two services detrimentally to the Garrison; the Field Artillery drill is smart and quick and he is very keen about it, but he gets disgusted with the slow and tedious redrilling at "elementary", and the almost more boresome drill with 64-prs. at the battery, where nothing is realistic and the antiquated mountings will not traverse, and are fitted with none of the later improvements, and where laying at a moving object becomes a farce. Under these circumstances, is it not natural that he should get the idea that all Garrison Artillery work must be equally slow and monotonous!

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[*] Major-General J. B. Richardson's evidence before Committee on Organization, 1888.

[†] Major-General S. J. Nicholson's evidence before Committee on Organization, 1888.

[‡] R.A.I. "Proceedings," Vol. XVIII., No. 12, "Having regard to recent improvements in *Matériel*, could the training of the *Personnel* of our Garrison Artillery be further perfected to ensure greater efficiency." By Colonel R. W. Rainsford_Hannay, R.A.

Rather better guns are to be given and smarter drill may be possible, but surely when the first training of our officers is of such importance, only the very quickest loading guns and mountings, fitted with the latest appliances for laying, should be supplied, and now that rapidity of fire is such an important factor in coast defence, extreme smartness in work should be aimed at.

Let us see what we may expect a cadet to know, on leaving the Academy, which affects his technical training as a Garrison Artilleryman! First taking the general subjects mentioned in Chapter II. we have:—

1. *Electricity.* This has made great strides of late and its importance is beginning to get recognized. The syllabus of instruction is very complete, and a cadet, on passing out, should have a sufficient theoretical knowledge of electricity to enable him to understand any instruments he is likely to come across. His practical instruction in setting up and working telephones, range indication and firing adjuncts, finding faults in circuits, etc., will however, have to be completed after joining.
2. *Chemistry.* The instruction in this is sufficient for all practical purposes.
3. *Steam.* The elementary application of steam in working engines is included in the Mechanism Course, and practical instruction is to be given in the appliances used in the workshops. The generation of steam in the more common form of boilers now in use, might with advantage be added to the syllabus.
4. *Hydraulics.* Though not forming a regular portion of the course, the practical employment of hydraulics is seen in machinery used in the Arsenal, and in jacks, buffers, etc. and the storage of power by means of accumulators is explained. The working of lifts and the principle of hydraulic pulleys should be taught and an officer would then join with a sufficient general knowledge of this subject.

   Hydro-pneumatics, as applied to mountings, forms part of the artillery instruction.
5. *Mechanism.* Instruction of a very practical sort is given, which includes gears and machinery of every description, most likely to be met with in artillery service.
6. *Theoretical Artillery.* A cdet's knowledge of theoretical artillery ought to be very good. He is taught gunnery, the manufacture of ordnance, the classes of ammunition, fuzes, etc., and the construction and working of the more important mountings. His instruction in this subject leaves little to be desired, and if he can remember one-half what he is taught, he may be considered well up in it.

7. He is also given a general idea of the employment, ranging, and organisation of field, coast and siege artillery.

As regards practical work:—

8. He should have a good knowledge of Field Artillery drill and understand the various systems of ranging in use. This, though not Garrison Artillery work, is a very important part of his training; it teaches him smartness at drill and quickness of action, and the ranging of field guns is the groundwork of ranging with coast guns, a fact sometimes overlooked at practice, where we too often see no attempt whatever made to obtain a bracket. The methods of ranging land face guns are also analogous and the principles he has learned will stand him in good stead.

9. He does a little drill with a 9″ R.M.L., a 6″ B.L. on hydro-pneumatic mounting, (which can rarely be worked and is of an experimental pattern), a 6·6″ Howitzer, a 4″ B.L. siege gun, a 3-pr. Hotchkiss, and is taught a little group work using 64-prs. The time available for these drills is, however, so limited and the conditions so unlike reality, that we may look upon a cadet's experience of drill with garrison guns as practically nil.

   The system lately adopted of sending classes for a week's practice at Shoeburyness, or of showing them round coast forts in the vicinity, is of the greatest value, and gives them an insight into practical work, which is unobtainable at Woolwich

10. He has a slight knowledge of mounting and dismounting 64-prs., the use of sleighs, sheers and derricks, and the working of gyns, jacks, etc., but the majority take little interest in these things, and there is little inducement for them to give any time to reading up about them. The most that can be done is to give them a good general idea of the elementary principles of artillery exercises and the manipulation of levers and tackles, but little time should be given up to "redrilling", which, with cadets, is the ruination of all smartness at this description of work, and which can be much more effectively taught after a young officer has joined.

11. Cadets are shown how to work Depression Range Finding and Position Finding instruments, but this instruction is necessarily very sketchy and of little practical value.

12. Hitherto the mechanical training in workshops has been much neglected. It is then satisfactory to learn that proper instruction is to be given. For a Garrison Artillery officer, nothing can be more useful than acquaintance with this subject; he often has complicated machinery and instruments to look after or has to superintend repairs, and in armament work generally, occasions are constantly occurring where a slight mechanical knowledge by the officer in charge would be of great advantage.

B. *Young Officers on First Appointment.*

On leaving the Academy, most young officers have, until quite recently, been sent for a short course at Shoeburyness.

This plan, though satisfactory from an instructional point of view, is not without its disadvantages.

The first impressions of the service which a young officer receives will often last him throughout his life, and he should immediately be brought in touch with his seniors and with regimental work, and be taught how to conduct himself in mess and on parade. At Shoeburyness, young officers are little better than cadets, they are nobody's children, they herd together and get but little chance of acquaintance with other officers and practically no knowledge of regimental work. We would suggest that those posted to stations where there is a Gunnery Instructor, should join their companies forthwith, and that all others should be attached to companies at Dover, Portsmouth, or Plymouth, according to the Division they belong to, for a period of two months. They would come under the immediate command of the officers commanding companies so far as discipline and duties are concerned, but for certain fixed hours per day would be entirely under the Instructor of Gunnery.

The dates of joining of each batch should be fairly well known, and it might then be arranged that a certain number of young non-commissioned officers and 1st class gunners should be told off to go through the course with them, a plan which would be beneficial in many ways, for "Being at work with non-commissioned officers who are anxious to learn has a good effect on young officers as regards both discipline and instruction."*

The young officers should take their places in the ranks until they have shown themselves sufficiently proficient to take command of, and drill, detachments. Opinions vary considerably as to the advisability of this, some saying that an officer will not have the same authority over men that he has drilled shoulder to shoulder with; but we think that if an officer has drilled with his men, and shown himself smart and attentive, and good at detail, they will know his real worth and respect him accordingly.

The course should be progressive and systematic, a regular programme of work being drawn up according to the appliances available, which should include the following if possible:—

Drill with quick-firing guns as working numbers and as Gun Group Commanders. This should be first taught, to ensure quickness in movement and decision, and as being the most important part of coast defence.

Drill with the principal heavy guns in the station, R.M.L. and B.L., as working numbers, Layers and Gun Captains, then as Gun Group Commanders.

Working of groups with Depression Range Finder and Position Finder in use, employing cases I., II., and III.; lectures being given on Coast Defence generally, on the Battery Commander's duties and the methods of ranging and on communications.

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* Colonel J. F. Bally, R.A. "Report of School of Gunnery." 1894.

Instruction in Depression Range Finder and Position Finder just sufficient to ensure a fair knowledge of these instruments and their use.

The supply of ammunition to guns and division of cartridges in groups; the lighting of magazines, working of lifts, etc. being explained.

The working of land front guns, systems of ranging at standing and moving targets, judging distances, and employment of machine guns or parapet mountings.

Drill with the principal siege guns, and instruction in the use of French's Sights and indirect laying, with a few short lectures on observation of fire and siege work generally but this training should be very rudimentary.

Elementary drill, mounting and dismounting 64-prs., gyn drill, machines and transporting carriages; first as working numbers, and then in charge of squads for redrilling; smartness and rapidity being insisted upon. This should include lectures on strength and weight of *materiél*, use of levers and tackles, etc. and be made as interesting as possible. It is most important that this preliminary work should be mastered thoroughly: it is the ground work of most shifts and teaches young officers to use judgment and to avoid and know the best way out of difficulties.

Rigging derricks and sheers, and the way of finding strains and thrusts as given in the handbook, should be carefully explained, the importance of working out all calculations when in charge being insisted upon.

The course should be taken to typical guns and told in detail how they were mounted, and how one should set about to dismount them again and to move carriages and slides. The mechanical details of all mountings should be shown, and practical information as to the method of filling buffers or cylinders of hydro-pneumatic mountings, etc. should not be forgotten.

Instruction in the electrical appliances in use at the station, such as telephones, firing keys, order dials, etc., should be given, including the ordinary tests and adjustments, care of cells and leads, etc.

During the course, young officers should be shown the various forts and batteries in the vicinity, the system employed in fighting each, how the guns are subdivided and what range or position finder works each group, etc. These visits are of the greatest possible value in that they let them see coast defence under varying conditions and teach them to think for themselves and become broad-minded. It must be remembered that several will perhaps be sent to stations where they will see little of up-to-date coast defence, and where their lately acquired knowledge may greatly assist in improving and making the best of the available armament.

Any other necessary instruction such as sword drill, physical drill, and bayonet exercise, must be given at early morning parades or odd times, they should attend office when possible and be attached for regimental duty to senior subalterns.

At the end of their course they should be examined by a board, and those only who prove themselves thoroughly efficient should be given the increased pay; those who fail to pass should have to wait at least six months before being allowed to go up for examination again.

C. *Junior Officers.*

During the first years of his service, an officer should be gradually instructed in the more important work of coast defence, as opportunity offers, and be given a fuller acquaintance with the subjects touched on during his young officer's course.

The aim of all coast artillery training should be to teach self-dependence, and, within reason, junior officers should be given great latitude in their work. They should have charge of their men and of their instruction and put them through a proper course of lectures. There is nothing which teaches so effectually as having to teach others!

All preliminary drills should be carried out under the subalterns, supervised by the captain or major, who once a week should take command and work the groups as a whole; when this is done all rules laid down should be most rigidly adhered to, and implicit obedience of orders and reliance on the chain of command, insisted upon; but it must not be forgotten that in war time this will often break down owing to the destruction of range instruments and communications, or if an attack is pressed home, when "the Gun Group Commander must not hesitate to take upon himself the responsibility for independent action."* Subalterns should then frequently be practised in carrying on the fire, and this should form an important part of their training. It is unfortunately very rarely done at practice, chiefly owing to want of ammunition, and is consequently neglected at drill.

Frequent drill and practice with quick-firing guns is the very best training a subaltern can get, and as in time of war, groups of quick-firing guns will probably be worked as independent commands, no pains should be spared in getting Gun Group Commanders well up in their use. Periodical courses should be held at all stations where such guns exist, and in addition to the ordinary drill by night and day, the working of search lights, position of mine fields, and probable methods used by the enemy in attack and in countermining, should be explained. Officers should be taken out occasionally on the "Miners" so that they may get to know the water area covered by mines, and should be told the system upon which this form of defence is carried out, the various kinds of mines in use, and the working of "test rooms."

A part of a Garrison Artilleryman's training which is usually much neglected, is mounting and dismounting guns. Much time is given up to the usual work with 64-pr. on garrison standing carriage, and this absorbs the greater number of hours devoted to this subject at the annual course. We have heard this drill compared to "Instructing an infantryman in the use of Brown Bess as a preliminary to the magazine rifle," and although we do not go quite so far as this, we think it a drill much overdone. It is excellent for teaching the manipulation of handspikes, etc., and for this reason young officers and recruits should be well grounded in it, but once this has been done it should only rarely be resorted to as a form of drill; the time should be given up to teaching work more likely to be useful in war time or emergency. Many officers go through several years of service without the smallest idea as to the best method of moving, mounting or dismounting heavy guns. The consequence is that when suddenly given a job of this description to carry out, a great deal of unnecessary time is wasted over it, and sometimes considerable damage is done.

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* "Garrison Artillery Drill"; Vol. 1., 1895, Part VI., Section VII.

With our present complicated mechanisms, a projectile from a small quick-firer might so injure a heavy gun mounting as to temporarily place it out of action, and much might depend upon its being repaired as soon as possible, in anticipation of renewed attack, to do which the gun, carriage, or slide, would very likely have to be moved. Many other instances of the necessity for rapidity in armament work could be quoted.

Considering the importance of this subject, great attention should be paid to it, and at the annual course such operations as dismounting and moving heavy guns, suspending a gun while the carriage is removed, turning over slides, taking the shields off hydro-pneumatic mountings, etc. etc., should form the main part of the instruction. It will probably be said that if this work is carried out with the armament guns, they will rarely be in a serviceable condition. To this we must answer that practice will bring its own cure; if our officers had a little more knowledge of the mechanism and methods of mounting the guns they use, we would rarely if ever hear of damage done, which in nine cases out of ten is due purely to want of experience.

All shifts should be carried out by the subalterns, who should be in no way interfered with, so long as they are not making any glaring mistake or doing something dangerous. They should not be tied to the book but allowed to use their own judgement and the resources available. They should be called upon when necessary to show all their calculations of strains, etc. and should give all important words of command themselves instead of standing by in a casual manner, while a sergeant does the whole work as is sometimes seen. It is only by this means that they can obtain intimate knowledge of this part of their profession, and confidence in themselves. The Instructor of Gunnery, if there is one, should always be available to give his advice if asked for, but should not interfere with the actual work.

In conjunction with the above the removal of buffers, elevating and traversing gear, adjustment of friction cones, compensating and other gears should be gone into, and an officer should know every detail of every mounting in his station, how to replace damaged parts, how to alter recoil, and the thousand and one things which make all the difference whether a mounting works well or does not.

Every subaltern must be put through a local course of Depression Range Finding and also of Position Finding if installed. The orders lately issued about examination in range and position finding will necessitate all officers having a good knowledge of this important subject; the syllabus of examination in depression range finding is very complete, and a good understanding of the practical working of position finding instruments will be ensured.

It is however, a very great pity that such a mystery is made of the internal mechanism and electrical connections of the latter, as otherwise officers would not so often condemn an excellent instrument on account of faults which might easily be remedied. If you wish a man to appreciate a thing you must let him understand it, or distrust will be the consequence!

We would suggest that the local course in position finding for officers should include, in addition to the practical work required for examination, a full description of the instrument and its connections, the interior of gun arm box, dials, etc., without going into small mechanical details, the ordinary methods of setting up and levelling, and the necessary adjustments. Circuits should be traced, the method of identifying wires explained, and the faults likely to occur and their cause pointed out.

Another important part in the training of junior officers should be signalling. "The subject of communication is the most vital one to the tactics of coast defence."*

We are now tremendously dependent on electrical communication and all know how treacherous these sometimes prove and the delays caused thereby. We must have an alternative system in case of breakdowns, and the semaphore has been adopted as the simplest, and also as allowing of ready communication with Her Majesty's ships. Every officer should know sufficient about this to be able to communicate himself or keep the trained signallers in hand, and seeing that it can be readily learnt in a very short time, it would not be too much to ask of every officer before promotion that he should be able to read at the rate of about eight or ten words a minute. They should also understand the employment of international code signals, and if, as is probable, the Morse code is re-introduced for night work, a certain number should be given special instruction in it.

D. *Officers generally.*

Under favourable circumstances, after three years in the Garrison Artillery, an officer should be fairly well up in his work, and his regular instruction may be said to cease, practice and experience taking its place, while courses will perfect him in details.

We have nevertheless such a diversity of armament, and such a variety of service, that each change of station means a good deal to be learnt, especially as regards the special form of defence required and the tactical working of the guns; we also have so many officers employed in various ways, who may not have had opportunities of keeping in touch with the latest changes, that it is impossible to frame any but the broadest rules for their instruction. All that can be done, is to give them every facility of bringing themselves up-to-date, which, if they have once mastered the elements of Garrison Artillery work, should not be difficult.

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* **Brig.-General A. A. Saunders R.A., "Report of School of Gunnery." 1895.**

At stations where there is an Instructor in Gunnery, it should be part of his duty to show officers, joining there for the first time, round the works, explaining the general principles upon which the guns are fought, ammunition supplied, ranges found and passed, and fire controlled.

The general knowledge of all officers should be kept up by frequent lectures and practical work under the superintendence of Lieut.-Colonels and their staff, special attention being paid to their training in the following subjects:—

A. *Communications.*—There should be frequent skeleton mannings of all the works, communications, range finding instruments, etc. This, if properly carried out, is a most effective way of teaching officers their particular duties, and it is a great pity it is not more often resorted to as a form of drill. Faults in telephones are discovered, Battery Commanders get in touch with their observers, and Gun Group Commanders learn their duties in predicting and giving words of command, almost as efficiently as if the guns were manned; it is besides the only way in which practice can be obtained in manning all the works at the same time, and allowing the Fire Commander to get used to directing fire, as the men available are rarely sufficient to do this with full detachments. On these occasions frequent casualties of all sorts should be imagined and prepared for. A certain form of attack likely to take place should be represented, any available boats or tugs being sent out as targets. If notes are taken as to the time fire was opened from each group, the ranges ordered, messages received, and number of rounds fired, they afford valuable data for judging the efficiency or otherwise of those concerned and for pointing out mistakes which should be remedied.

B. *Tactics.*—This is a subject little studied as a rule, and which should form an important part of all training. Very few officers have any real idea of the tactics that would be adopted by hostile torpedo-boats in raiding harbours at night,* or of the formations and evolutions of ships attacking forts, and the best means of meeting such attacks. Personal study of operations in the past and acquaintance with the ways and opinions of the Navy, is very necessary; artillery officers should on every possible occasion be attached to Her Majesty's Ships during naval manœuvres and be allowed on board torpedo-boats when simulating the attack of a harbour.†

We so rarely carry out combined operations, that we have little notion of the part the Navy would play in assisting us in defence, and are consequently apt to omit it from our plans, whereas in war time it would have to be taken into consideration. If occasionally part of the Naval Manœuvres could be devoted to the attack of coast fortresses the advantage to all concerned would be very great, and we would get a better idea of what to be prepared for. Frequent night attacks by torpedo-boats are especially valuable both to our coast defence troops and to the naval officers concerned.

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* R.A.I. "Proceedings," Vol. XXVI., No. 1, "Coast Defence against Torpedo-Boat Attack" By Major-General J. B. Richardson, R.A.

† *Idem.*

C. *Identification of Ships.*—There is little opportunity of learning this practically in home waters and of using identification cards, but a general knowledge of the types of ships afloat and their appearance should be part of every coast artillery officer's attainments. During the winter months, lectures might with advantage be given, if possible by naval officers or others who have made a special study of the subject, in which the main features of the ships of various powers would be explained. Those who have had the opportunity of attending Captain C. Orde Browne's lectures will realise the benefit conferred by this form of instruction. Opportunities should also be taken, whenever possible, of showing officers over the dockyards. The identification sheets should be more freely used, so that all may know how a certain class of ship may be recognized and attacked. A great deal more practice than is generally obtainable is required for the clear understanding of Fire Commander's orders and taking prompt action upon them.

D. *Supply of Ammunition.*—This is usually much neglected but in war time will be of vital importance, especially now that rapidity of fire is becoming such a factor in coast defence. All officers should be fully instructed in all details connected therewith; they should know the system in which cartridges are grouped, the order in which groups are to be used up, the working of lifts, the method of communicating with magazines, etc. In most batteries the arrangements are simple and easily understood, but in some of the older forts they are most complicated, and require a great deal of supervision by officers concerned to ensure a rapid supply of projectiles. " A thorough knowledge of the ammunition service is of very great importance to the Garrison Artillery, for without it, all time and thought expended on the production of its *materiél* and on the augmentation of the accuracy of fire may be rendered useless."*

All magazines and lifts should occasionally be manned, and all Gun Group Commanders should be required to make themselves acquainted with the details of ammunition supply to their guns.

E. *Battery Commander's duties.*—These can only be thoroughly learnt by practical experience and personal study. The Battery Commander's post is the most important connected with Garrison Artillery service and requires peculiar quickness and clearheadedness. The difficulties of the position are rarely brought home at drill and peace practice, when probably only one or two groups are used, the target is distinct, and the Battery Commander can recognize his own splashes and judge his corrections. In actual service the case would be very different, and if he is not efficient the whole effect of the fire of his groups is lost. Officers should learn from the very beginning how fire is controlled and corrected, and the junior ranks should be given every opportunity at drill and when possible at practice, of acting as Battery Commander.

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* Ammunition Service of a fort." By Major J. F. Johnson, R.A.

The first essential is a thorough understanding of the range instruments used and of their capabilities, and frequent work with the operators, using every case, and passing from one case to another. Every officer should periodically be given opportunities of working instruments himself, in order that he may keep in touch with any changes.

F. *Fire Commander's duties.*—These, as before mentioned, can only be efficiently carried out by an intimate knowledge of the duties of subordinates, and by constant practice in directing the fire of the different works. In time of war a Fire Commander who has no experience, would greatly handicap the defence. "The rapid choice of an objective, the transmission of the necessary orders to Battery Commanders . . . and finally the decision as to the right moment for handing over the control of fire to Battery Commanders, are all matters which require experience, . . . the want of which might entail serious consequences in action."*

G. *Defence of land front.*—In Chapter II. we attempted to show the importance of this class of defence. As a cadet an officer has probably obtained a good grounding in the methods of fire employed in Field Artillery; this knowledge should be kept up by frequent drill with the light armament for general defence, ranging being practised against stationary and moving targets. This will teach the use of time shrapnel which is rarely employed in coast defence, and not generally very well understood. The use of range finders for land service, and judging distances, should be taught. As practice over land ranges is rarely possible, it should be carried out against targets representing landing parties in boats, in which case the system of fire to be employed is identical.†

H. *Siege work.*—A certain amount of drill with siege guns and howitzers, forms part of nearly every annual course, but officers should receive a more thorough training in siege work, which might advantageously be carried out annually by the Instructor of Gunnery when siege equipment exists. A fair theoretical knowledge is obtainable by lectures and examination of practice reports, and the use of observing instruments and slide rules, laying out lines of fire, aiming at auxiliary marks, etc., can be taught practically without much trouble. A certain number of officers get a good training in this work during the Long and Short Courses, but those who have not had such opportunities should be allowed to attend at Lydd for a fortnight, whenever they can be spared from their companies; seeing the work carried on under practically service conditions, they very soon would get a good general knowledge of the systems of fire, and with a little working up could take their place in the siege train if required.

E. *Courses of Instruction and Specialists.*

The courses affecting Garrison Artillery are numerous, so numerous that they may be said to indirectly prejudice the good training of Garrison Artillery as a whole, for a great number of officers are on command during the drill season, just when their services with their companies are most required, and these in consequence often have to go through their annual course with only three, or sometimes only two officers available. It is unnecessary to point out the evil consequences of this state of things. Much might be done towards remedying it by reducing the number of courses at Woolwich and giving local instruction instead, and by seconding officers attending courses of over six months' duration.

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* R.A.I. "Proceedings," Vol. XXII., No. 7, "The training together in Peace Time the Garrison Artillery Forces of the Empire, including Regular, Militia, Volunteer and Colonial Artillery." By Colonel R. F. Williams, R.A.

† "Garrison Artillery Drill", Vol. 1, Part VII., Sec. V.

Putting aside the Staff College, Advanced and Firemaster's classes, which are not purely for Garrison Artillery Instruction, with the remark that all officers attending these should be seconded, we have the following:—

1. Short Course at Shoeburyness.

This has of late years been for the training of young officers on first appointment; these as before mentioned, should be put through their preliminary work under local Instructors of Gunnery. The course should, however, be kept up in a modified form for the instruction of officers at single company stations, who have had little opportunity of obtaining the necessary knowledge of coast and siege work, and of those who have returned from stations abroad or who for any reason may require rubbing up in their work. It should last about six weeks, one month being at Shoeburyness when they should run through drill, shifts and siege work with the Short Course non-commissionedofficers and a fortnight at Harwich or Golden Hill when they could be taught coast defence tactics, the working of range instruments and search lights, practice with quick-firing guns, etc. Harwich would be an excellent place for this instruction, having various types of ordnance in casemates and open works, and being typical of defence against torpedo-boats, etc.

2. Long Course.

This is by far the most important Garrison Artillery Course, and it should hold the same position with us that the Staff College holds with the rest of the army and the Gunnery and Torpedo Courses in the Navy, and only specially selected men who are keen about and well up in their work, and are likely to make good instructors and staff officers, should be allowed to join.

Its special objects should be the higher education of officers generally and the training of "specialists", Instructors in Gunnery and Instructors in Range Finding, who can in turn instruct locally.

Instructors of Gunnery should have a special knowledge of the attack and defence of coast forts, of the details of the mechanism of the various guns and mountings, should be well up in siege and field artillery, and be capable of instructing in steam and hydraulics.

Instructors of Range Finding should deal with all instruments and electrical appliances connected with finding and passing ranges, including their application on the gun floor, and should be qualified to instruct in electricity.

The duties of Instructor in Gunnery and Instructor in Range Finding, should be interchangeable, so that in case of absence of one of them, the instruction may still be carried on and the instruments looked after; for this reason, we think that the long course certificate should be necessary for appointment as one or the other, and we would suggest the absorbtion of the special course of position finding into this course. If the previous suggestion of instructing all officers in Position Finding, giving explanations of the mechanism and of setting up, were adopted, they would join with a good knowledge of these instruments and their working, and a very short time at the arsenal would suffice to teach them the details, tests, adjustments, and repairs necessary, the stay of the course at Woolwich being lengthened a fortnight or three weeks to allow of this.

Officers joining the Long Course, whether from home or abroad, should be seconded. It should be a purely Garrison Artillery course and should not be open to officers of mounted branches; a great deal of time which is wasted in teaching the preliminary drills for the benefit of these and other officers not well up in their work, would thus be saved and could be devoted to training in the higher branches of coast defence and siege work, which should form the chief part of the instruction.

Heavy shifts should be very thoroughly taught, especially as regards the calculation of strains, weight, power, etc. No time should be given up in working with obsolete or experimental mountings, but only the guns and carriages most likely to be met with, and the shifts most probably required under ordinary circumstances, should be explained.

The course is a thoroughly practical one and gives an officer a good knowledge of all branches, the visits to Sheerness, Lydd and Golden Hill being particularly instructive. " The advantages to the Course of these visits are great, in that a practical knowledge is gained of the methods of fighting forts of different types and practice from siege guns at Lydd is carried out under service conditions."*

3. Special Course of Position Finding.

This as above suggested, should be abolished.

4. Special Course of Steam, Hydraulics and Electricity.

This might well be abolished. The greater number of officers on the subaltern's list have already been educated in these subjects at the Academy, and of the remainder only a very small proportion attend the course at Woolwich. Forming, as it does, part of the Long Course, we have a number of officers with a special knowledge who should be able to teach others.

Efficient instruction in electricity could be given locally by Instructors in Range Finding who should hold courses periodically which all not well up in the subject should attend.

Sufficient electrical apparatus for instructional purposes should be supplied to all the larger stations. The course should be confined to electricity in its general application to coast defence, and the text book should be "Electricity for use of Garrison Artillery."

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* Colonel J. F. Bally, R.A. "-Report of School of Gunnery." 1894.

In the few stations where steam or hydraulic power is in use for working guns, all officers should be thoroughly taught the elements of the subject by the local Instructor in Gunnery, and the mechanism should be fully explained by him or by the Inspector of Ordnance Machinery.

5. Coast Defence Course at Golden Hill.

The more senior officers, captains, majors and lieut.-colonels, who for any reason have got out of date, might with great advantage be sent to the Western Forts for a fortnight during the stay of one of the Divisions there, watching the drill and practice, and being instructed in the latest orders as regards Battery Commander's and Fire Commander's duties, system of ranging, working of instruments, electric lights, etc.

6. Course of Quick Firing practice at Shoeburyness.

This should be instituted for the purpose of carrying out this practice by night and day. A selected subaltern and a proportion of men should be sent annually from all companies who have charge of this class of armament, but who, owing to traffic, etc., are unable to do night firing at their own station. All drill having been taught locally a stay of two or three days at Shoeburyness would be sufficient.

SIEGE ARTILLERY OFFICERS.

There is comparatively little to be said about the technical training of officers in Siege Artillery, and most of the foregoing remarks are applicable to them. Their preliminary instruction should follow the same lines as that of coast artillerymen; in fact, we think that on first appointment they should be attached to coast artillery companies and go through the course suggested; this would qualify them to draw armament pay and would give them a fair knowledge of coast defence from the first. On joining a siege train company, they should be put through a further course of instruction in their particular work, being taught every detail of drill, mounting and dismounting, etc., of siege guns and the subjects mentioned in Chapter II.

Siege train officers are in a far better position to learn their work efficiently than coast artillerymen; they attend at the same camp every year, are there put through a thoroughly practical course, are lectured to on siege operations and on any experiments and improvements carried out during the past year, and practice under service conditions; the tactics to be studied are limited in scope and do not vary much, the drill with each nature of gun is practically identical, and a knowledge of the work is very quickly obtained. No special training is required beyond what they receive with their companies in the ordinary course, when attending at Lydd, by practical experience, and by personal study.

Siege train companies should however, frequently be practised in the defence of land fronts of fortresses and must not altogether neglect coast defence; for this reason they should devote one month in the year to drill with heavy guns and coast duties generally, omitting those subjects which require specialist training, such as the working of range instruments and communications, the details for which should be found by the district staff.

The officers should keep in touch with this work, being sent for short courses to Shoeburyness or Golden Hill when necessary.

CONCLUSION.

We have attempted to trace the training required from the day a man joins the Royal Military Academy as a Cadet, till he rises to the higher ranks of his profession, and have taken as an example an officer who starts as and remains a coast artilleryman. The consideration of the training of officers who enter the Regiment without the Academy course would be beyond the limits of this Essay, and we will only say that they should be given as much instruction as possible in the technical subjects enumerated, by attending special courses at the Ordnance College and at Shoeburyness.

It will also be noticed that we make no mention of the case of officers transferred from the mounted branches to Garrison Artillery, for as we write, we are approaching the period of the year when rumours and schemes of separation are rife, and when, no doubt, the long promised division of our Regiment is about to take place.

In conclusion, the suggestions made in the preceding chapters may be summed up as follows:—

1. A progressive training, with a definite object in view, should commence from the day a cadet joins the Royal Military Academy.
2. The difference between coast and siege artillery training should be more distinct.
3. A great deal more local instruction should be given than at present, courses being formed annually at all the larger stations for training in siege work, electricity, steam and hydraulics, range finding, signalling, and quick firing guns, according to circumstances.
4. More attention should be paid to instruction in armament work.
5. Besides the ordinary training available, a great deal of personal study is very necessary, an officer must make the best of every opportunity given him of increasing his knowledge, and must remember, that when all is said and done, the best training of all is that afforded by experience to obtain which one must " Live and Learn."

u. g.

THE TECHNICAL TRAINING OF OFFICERS

IN

GARRISON ARTILLERY.

BY

CAPTAIN A. W. PACK-BERESFORD, R.F.A.

WHEN THE STRONG MAN ARMED KEEPETH HIS PALACE,
HIS GOODS ARE IN PEACE."

"DUNCAN" COMMENDED ESSAY, 1899.

BEFORE suggesting a new system of training for the Garrison Artillery, it is well to consider, whether the present system is a good one, and then to see how it can be bettered.

Present System. At once we are met by a difficulty.

There does not appear to be any logical system of training and it is a matter of accident whether the officers of the Garrison Artillery get any training at all, beyond the general knowledge which they are bound to pick up in their service companies. When the young officers leave the Royal Military Academy it is a mere chance what happens to them. Some go to the Field Artillery, and the others are taken apparently at random and scattered throughout the world.

A few are quartered at home. Some go to the large fortresses at Gibraltar and Malta, others are sent out to small Colonial stations. They go out just at an age when they are most susceptible to the influence of their surroundings, and the two or three years which follow have an immense effect in forming their characters and determining their future.

Defects. It is not at all an unusual thing to find a company containing nothing but 2nd Lieutenants, possibly without a captain. They have to try as well as they can to sift right methods from wrong and to discover the ways of the service. Perhaps they work out their own salvation, it is more likely that they do not.

Sometimes they are sent to a station in an out-of-the-way part of the world, and the first thing they are told is that the guns there are all obsolete. How can this have an effect other than prejudicial? Who can blame the young officer who says "This is no place for me. I will serve in a branch of the service which is not obsolete"?

Present System of Courses.

To turn to the subject of courses. The routine at present adopted is to send to some command, an order to detail an officer for a course, Position Finding, Firemaster or whatever it may be. Again there is a dip in the lucky bag, an officer whose tastes lie in the direction of chemistry etc. and who wishes to be a firemaster, is made into a Position Finder; the exigencies of the service demand it. Having gone through his course, he is ordered to take up a Position Finding appointment; he has to leave the company he is fond of and wishes to serve in and devote himself to a minor branch of his profession which is one he does not care for.

No doubt he does his duty as well as he can, but how is it possible for his heart to be in it?

Present Specialists.

It must be bad for an officer of four or five years' service, to be put in a position where he loses all touch of regimental duty; where he never goes to a court-martial, turns out a guard, or visits a dinner. A subaltern who has done five or six years of this semi-staff work, and is then sent to a company as a junior captain, cannot expect to do it justice and must on all points of minor administration and interior economy be in the hands of his subordinates.

Again in stations where the Regiment is short-handed it is no unusual thing to find one subaltern doing all the work of the place, perhaps moving heavy guns, a work requiring nerve and skill. He gets no extra pay, while another subaltern who happens to be an Instructor in Range Finding specialist is drawing an extra half-crown a day and he perhaps does less work.

This cannot fail to create ill-feeling and discontent.

Remedies.

We cannot help the guns being obsolete and we have to take such men as we can get, and make the best of them; but the young officer is there ready to hand, and by putting him through a course of systematic training and carrying out a small amount of reorganization which is dependent on it, the efficiency of the Garrison Artillery could be largely increased and the service in it very much popularized.

It now remains to show how this is to be done.

Officers on Joining.

When we consider the case of an officer who enters the Garrison Artillery, and intends to stay in it, we must realize that he is entering a branch of the service at least as intricate and technical as the Royal Engineers, and must be prepared to spend a certain amount of time in fitting him for it, before he is sent out as the finished article.

The Engineers spend two years at Chatham getting this preliminary polish but for the Garrison Gunner only one year would be necessary, and that year need not all be taken at once.

It is impossible to make a man master of all trades and yet there are very many matters which it is essential for a gunner to know.

The subjects with which he has to deal admit of division into two classes. First, general subjects which he must know. Second, special subjects which it is desirable that he should know.

The young officer on joining should have a six months' course in the general subjects; he should then be sent to a company for two years and after he had time to see in what direction his tastes lay, he should receive a further six months' course in a subject which he would himself select.

Essential Subjects. The subjects which are essential will readily suggest themselves:—

Drill and knowledge of imparting it.

Elementary knowledge of Interior Economy, Military Law, Siege Works, Guns, Ammunition, Range Finding and Laying.

Special Subjects. The special subjects can as a matter of convenience, be divided into five classes:—

(1) Position finding, electricity and telephony.
(2) Siege artillery and theory of gunnery.
(3) Steam, mechanics and moving heavy guns.
(4) Chemistry and ammunition.
(5) Identification of ships and theory of coast defence.

First Course. To go into matters more fully. The first six months' course would come directly after the course at the Academy. During this course the young officer would learn to drill with all natures of guns and further he would be made to drill his comrades, and he would be taught how to impart instruction. This is a subject which is at present totally neglected.

He would be lectured on the "Queen's Regulations," interior economy and military law. The lectures would be few and given chiefly to direct his reading, and for theoretical knowledge in these subjects he would have to read, and be examined in what he had read at the end of the course. Practical knowledge can however, only come with experience.

He should see heavy guns mounted and dismounted under fairly easy circumstances and favourable surroundings.

He should handle siege guns and be sent on range to see and record the results of their fire.

The knowledge of the composition and handling of ammunition is a thing which is taught at the Academy and very little extra would be needed.

He should be taught the theory and practice of Depression Range Finding so as to be able to take ranges, but not to go deeply into the subject.

He should be taught how to lay and how to instruct and examine a squad of layers.

After the First Course. After six months he should be made to pass an examination and his armament pay would depend on his success. At the end of the course we should have an officer who would be of use in any company; one who could take a squad and instruct it; who would make out a satisfactory report if sent on range.

One who would have an idea of what punishment a man ought to get for various classes of offences. One who could be trusted to take ranges during practice and who could examine the layers at their weekly test.

Such an officer any major would be glad to have sent to him.

He should then be sent to join a service company at home, Malta or Gibraltar and should serve in it for two years, taking things as they came and having his share of leave. It would be preferable to have all the young officers at home, but there are not sufficient companies to receive them; the balance might be sent to Malta or Gibraltar. There they would be within easy reach of England so as to return for their second course, and there are so many companies in these fortresses, that it would not be necessary to send more than one young officer to each company, and to have one young officer in them would not alter their conditions of service.

When he had two years and six months service he should be brought back and put through a specialist course lasting six months.

Specialist Course.

The special subjects as has already been stated would be five.

First.—Position finding, electricity and telephony.

Position Finding Course.

This would be very much the same as the Position Finding course at present, but more thorough. The specialist would be made a good electrician with practical, as well as theoretical knowledge. He would be taught the care and conduct of search lights, which is at present left in the hands of the Engineers. He should, when he has finished this course, be not merely a theorist, but a good practical electrician.

Secondly.—Steam mechanics and movement of heavy guns.

Mechanics Course.

This only includes steam as applied to gun mountings. The specialist in this class would be given a thorough knowledge of all mountings likely to be met with. His knowledge should be so practical, that he could put in order any small defect or jam which might occur at practice, without being dependent on the Inspector of Ordnance Machinery. He should have a thorough practical knowledge of heavy shifts, moving guns from barges into and out of casemates in cramped positions and under unfavourable circumstances. This course would take the place of the present Steam Mechanics course.

Thirdly.—Siege Artillery and theoretical gunnery.

Gunnery Course.

In this course the specialist would be taught the placing and forming of siege batteries. Effect of shells on earthwork and masonry. Penetration of armour. Effect on range and trajectory of altering gravimetric density, working out probabilities, checking and criticising range reports. This course would be a modification of the Long Course and would take its place.

Fourthly.—Chemistry and ammunition.

Chemistry Course.

This course would include the effect of climate on powder, fuzes, etc. The examination of ammunition and a thorough knowledge of all laboratory operations. It would take the place of the present Firemaster's Course.

Fifthly.—We come to a suggested new departure.

Naval Course. Specialists are urgently required for the identification of ships and theoretical coast defence. These are subjects which at present a Garrison Artilleryman is supposed to know intuitively without having been taught them.

The course would include, first, lectures and instruction on all the various schemes for defending our ports and coaling stations, pointing out the theory, the good points and the defects. Second, lectures on the different classes of ships in our own and other navies, and the means of identifying them.

Lastly the officers of the course would be sent to sea in a man-of-war for three months. They would see all the Mediterranean, Home and Channel defences from the sea side and get an idea under what sort of conditions ships live and fight; what sort of things they can, and what they cannot do.

After the Course. When the officer had finished whichever of these courses he might take up and become a specialist, he would join a company abroad. He should by this time be an officer whose opinion would carry weight on his own subject among all ranks, and who would be none the less a good Garrison Gunner.

Outline of Garrison Artillery Career. Now let us glance at the career of a young officer who selects to go into the Garrison Artillery under the proposed new regime.

After he leaves the Royal Military Academy he would go straight to his six months' course, he would not have lost the habit of working, and he would find himself associated with others who have to work as he does.

He would be kept at work for about six hours a day; and at his age he ought to be able to absorb a great deal of knowledge in six months. He would look forward to his examination at the end of six months and would work in his spare time for it, as he would know if he did not pass he would not get his armament pay.

At the end of the course he would go to his company at home, or at Malta or Gibraltar; as has been said before, he would be no raw Gentleman Cadet who does not know how to give a word of command; but an officer of six months' standing, who can instruct at drill, deal with minor offences, and who has picked up a good smattering of the customs of the service.

The next two years he would spend with his company; he would know he will one day have to become a specialist and he would gradually see where his tastes lay. By the end of the first year he would have made up his mind what speciality he would take up, and at the end of the second year he would have given himself a good grounding in his subject and would be in a ripe condition to undergo his six months' course.

At the end of his second year (when he has two and a half years' service) his connection with his company would cease, and he would be seconded for his specialist course.

He would go back to Woolwich and undergo one of the five courses which have been described, and at the end of three years we would have the finished article; a 1st Lieutenant with a good general knowledge of his profession and a specialist in one branch of it. He would be sent to a company abroad. His major would be glad to see him, he would enter at once on his duties; if he were left to himself he would by that time have learned right from wrong, and there would be no question of his needing licking into shape and not getting it. There he may be left for the present and we will turn to discuss the advantages of the system

Advantages of the proposed System.

First—The rough edge would be taken off a Gentleman Cadet before he was sent to his company, where there may be no opportunity for doing so.

Second—It will be easier to instruct the young officer. At present, when a young officer first joins, he has to undergo a certain amount of drill and instruction, but he does it alone, whilst his brother officers are enjoying themselves elsewhere. In his heart he probably wishes he were with them. It would in nearly all places be hard to get a young officer to do six hours' drill a day and to work in his spare time as well, but by having a course with an examination at the end of it, this matter is quite easy

Third—The present unsound practice of sending young officers abroad haphazard would be done away with. A gunner is not allowed to leave England until he is twenty; why should an officer be less well cared for? This is not only a question of health. The first three years' service are very important ones, during that time habits are formed and characters determined, perhaps for life; surely it is important that a young officer should be carefully watched and not allowed to learn undesirable foreign habits and customs before he has seen a little of his own country.

Present Specialists.

Fourth—The specialists who are at present not borne on the strength of companies would become extinct, or rather would be absorbed into the companies. In case of an attack every one would fall into his place and help to fight the batteries.

The firemaster would have seen his ammunition is right in peace, and in war he would have to show that he knew how to use it. The Instructor in Range Finding would have trained his men in peace, in war he would have to remember he is a gunner and his schoolmaster vocation must for the time be put on one side. This is very necessary, for if you take a station where there is only one Position Finding specialist and three forts with instruments, he cannot be in more than one place at the same time, and in war time he must depend on the men he has trained and not on himself. So he would become a Gun Group Commander ready to help at the Position Finder, if ordered to do so.

Unrecognized Specialists.

Fifth—It is a matter of common note that there are unrecognized and unpaid specialists in the Garrison Artillery at present. If heavy armament work has to be done, the Commanding Officer is told that one of his officers is good at this work and fond of it. If a calculation has to be made or plans drawn up, another officer is pointed out as having taken up this line. These are true specialists and only want encouraging and helping on in their own line to be of the utmost value.

Sixth—At present. if heavy armament work has to be done, it has to be carried out by an officer who has a partially trained aptitude in this line, or failing him, by a sergeant who has been through the Long Course In future the armament specialist would be summoned and the work properly done.

Seventh—The "Garrison Artillery Drill" directs that the Fire Commander shall identify the vessels approaching. It admits that "the enemy will do all in his power to disguise his vessels" and yet it takes the optimistic view that "he (the Fire Commander) should soon be able to master this" (i.e., the identification of ships,) "or he should choose an officer who has shown an aptitude." The new course will provide such an officer and this important matter will no longer be left to chance.

Eighth—If a question of coast defence is being discussed, at present the senior officer Royal Artillery is summoned. He may have travelled and seen coast defences elsewhere, his opinion may be of the utmost value; but, if he has served inland perhaps in other branches of the service, his opinion cannot carry weight; whereas a properly trained junior officer could put forward the scientific theoretical aspect of the question and leave it to be settled by those senior to him, as to how the principles could be best carried out.

This is a most important point, for coast defence is a subject involving the expenditure of large sums of money. and mistakes once made cannot be readily rectified.

Alteration in Organization. It will now be well to discuss the alterations in organization, which are dependent on the introduction of a new system.

At present there is a great disinclination among the senior ranks to go abroad, and a company at home is a thing to be sought after and paid for.

The companies at home and abroad are regarded as being on much the same footing and the same work is expected from each. This is the result of a failure to recognize the totally different conditions under which they serve. The difference must exist, and instead of trying to gloss over the fact of our home garrison companies being composed of raw soldiers and our foreign companies of trained men, it is better to emphasize the difference and to legislate for it. Assuming the scheme which has been suggested as being carried out, the difference will be still more strongly marked.

Home Companies. In a company at home there will be one senior subaltern and one or two young officers and a number of young soldiers, the whole year would be spent in training these officers and men into as high an efficiency as can be attained. Until the recruits can be enlisted in large batches it is hard to lay down a systematic scheme for their instruction.

The major's lot would not be an enviable one, he would be commanding a sort of glorified depôt and trying to make the best of raw materials. But should any emergency arise the companies at a few days' notice can be stiffened into any degree of serviceability that is required, by the addition of reserve men, and if there is a paucity of officers, it can be made good at twenty-four hours notice. The company would have a scrambling time and probably would not be very smart, but if it were wanted for service it would not be found wanting.

Foreign Companies.

To turn now to companies on foreign service, a totally different problem presents itself. The men are all trained and of the subalterns, none would have less than three years' service. The machine would be there to hand and the question would be how to make it most efficient. The following systematic course is suggested:—

Two points must be recognized; that on foreign service, officers want leave, and that trained men do not require to be kept in the collar all the year round.

Division of the year.

The year would be rigidly divided into two periods, the drill season and the leave season.

During the drill season every officer should be present.

During the leave season as few officers as it is possible to carry on the work with.

To take a company of normal strength, during the leave season, the Major or Captain and one subaltern should amply suffice.

In this connection it must be pointed out that the disability Companies suffer from of bearing officers on their strength who are at the Staff College or going through the Long Course, ought to be for once and for ever abolished.

To consider the year's work at a foreign station with a hot summer, April to September would be the leave season.

By the first of October all the officers would be back, all having had their share of leave, glad to see each other again and anxious to commence work.

Subaltern's Course.

In October the first courses would begin; they would be absolutely under the subalterns, supervised by the major. Each of them would make out his own scheme, and at the end of his course, his section would be inspected and he would be judged by its efficiency. These courses would go on during October and November.

Major's Course.

On the first of December the major would take over his company; which should be by that time thoroughly exercised in drill. During December and January he would work his men up and at the end of January he would do his competitive practice.

Colonel's Course.

February and March would be the colonel's months. They would be devoted to working out schemes of coast defence, mobilizing, manning all forts, and working intelligently on the broad base of solid drill which would have been prepared.

After March the drill season would be over and during the summer, things would be let down easy. Classes would be formed for specialists, and armament work would be carried out.

Specialists.

Now during the whole year the only time when the specialist would have to keep his work in abeyance, would be when he is instructing his section for their first course, and when he is on leave. While the other subaltern courses are going on, he could devote himself entirely to it, and while the major's and colonel's courses are going forward he would rarely be required for more than two or three hours a day, twice or three times a week. In the summer he would hold courses in his speciality and this he could easily arrange to fit in with his company work.

During the drill season, lectures would be given to the whole garrison, each officer lecturing on the subjects which he had made his own. These lectures would be of interest, not only to the officers and men of the Royal Artillery, but those about the navies of foreign countries, would attract officers of other branches of the service.

Economical Aspect. To refer now to the economical aspect of the new system. No officer would receive his armament pay until he had passed a satisfactory examination at the end of his first or general course. If he did not pass satisfactorily, his pay would be withheld till he did. This would be an incentive to young officers to work, and as they probably join the army with a sort of " boy out of school "feeling it would save a great deal of trouble. The present specialists would be absorbed into the Regiment, and their pay would be saved.

When the second (or specialist) course of six months was over, the officers would be classed. All classed as very good, would receive an extra shilling a day. It is surely not much to ask an officer to be very good in a subject which he is allowed to choose—90% should come up to this standard. The extra expense of this shilling would be more than covered by the saving of the specialist pay.

There are in the February Issue of the Royal Artillery Regimental List, nine officers shown as Instructors in Range Finding, three are shown as Instructors in Gunnery. They are paid at the rate of 11/4 each. By absorbing them into the Regiment a saving of 136 shillings a day would be effected. There are now some 130 1st lieutenants serving in the Garrison Artillery, and the amount saved would provide each of these with an extra shilling. The cost of the new courses would be covered to a great extent by the abolition of the old ones.

Management of men. There are also a few reforms with regard to the management of the men which must be referred to as they are bound up with the introduction of systematic management. One of the evils of the Garrison Artillery is the way men are employed, and their major cannot touch them. It is a rare, it would almost be fair to say, an unheard of thing, for a major to see his whole company on parade except at inspections. This must be wrong. A hard and fast rule should be introduced that every employed man, signaller and servant, mess butler and artificer, should attend parade once a week. A parade rarely lasts more than two or three hours, and to ask a man who is paid as a soldier to devote two hours a week to his profession is surely not much. Every sort of difficulty would no doubt be made to this reform, but if an order were issued, things would accommodate themselves to it.

Trained men. Again when a man is trained and dismissed he should not be sent to standing gun drill, simply in order to do it. If he is slack or does not know it let him have drill *ad nauseam* till he does. But if he does know his drill, he should be put to do something else. It would be infinitely better to have a man cultivating his garden of a morning than to have him standing behind a 10″ gun wondering when his drill will be over and he can get away to his canteen. When a man is a trained gunner, he should be taken once or twice a week to a big parade to show him that he is part of the machine; and on the other days, let him be practised in his speciality, whatever it may be, signalling, laying or range finding, and in the time which is left he should be taught a trade, or to till the soil, so as to make himself a good labourer, one who can, when he leaves the service, earn his living with his spade, or in some other way. A trained gunner who attends two parades a week, who has his hands hard, and who is not afraid of a day's work, is a far better soldier than a man who has been marked up in the drill record as "present" every day at standing gun drill.

Thursday. With trained men five working days are ample in the week, and Thursday may well be set aside as a day of leisure. Officers and men should be encouraged to develop their individualities and tastes, and one day in the week given up to fishing, shooting, boating, football or cricket, is not by any means a day lost.

Objections. It will be well to refer to what appear to be objections to the system which is proposed. First, a major at home would not care to have a subaltern coming to him for two years, and would not take pains with him, knowing he was to lose him as soon as he became valuable.

At present there is undoubtedly as already stated, a great desire on the part of senior officers to serve at home, and if a man has the good fortune to serve at home, he must put up with the counter-balancing hardships. If a major was ordered abroad he would at least have the satisfaction of knowing that he had reliable officers and a trained company to work with.

Second, that the young officers crowding into the home companies would reduce their effiiciency. The young officers must be somewhere and at present in companies abroad by reason of sickness, leave and transfers, it often happens that the command of a company is thrown on the shoulders of an officer of less than three years' service, and this state of things cannot be rectified in less than two months. At home, should it occur, a few days at most, will set it right.

Third, that a man cannot do two things at once, i.e. be a specialist and a company officer at the same time. This objection would never be put forward by a company officer and could not be upheld by anyone. If the specialist were taken for two or three hours in the morning for his company work, he would have all the rest of the day for his special work and classes; and he would have to learn to apportion his time so as to make things fit in.

An objection might be put forward to the systematic training of companies, that if the enemy attacked at the beginning of the systematic course, the company would not be in a state to meet him. The answer is, that it would at least be as well off as it is now, and war is not declared at a moment's notice.

Epitome of Advantages.

Before summing up it will be well to epitomise the advantages of the proposed new scheme:—

Every officer would have six months' solid instruction put into him before he joins.

No young officers would be sent abroad to lose their health and pick up bad habits.

Every officer would be encouraged to make himself a specialist in his own subject.

Extra pay would be put in the reach of every subaltern.

The unrecognized specialists of to-day, would be recognized and encouraged.

The specialist of to-day would be made into a more useful and efficient officer.

A company abroad would be made a thing to be sought after rather than avoided.

There would be no paper officers and consequently plenty of leave for everybody.

There would be systematic courses of instruction for companies.

Specialists would be introduced for identifying ships.

It will be noticed that all these things tend to increase the pay and better the position of the subaltern. It is when a man is a subaltern, that his character is formed, and it is during his first few years that he has the hardest work to keep his head above water financially, and if the service is made attractive to subalterns the other ranks fill up in time. A captain is of less importance; his character is formed and his pay is higher.

Popularity of Garrison Artillery.

All these advantages could not fail to popularise the Garrison Artillery, and in many ways this would mean that the efficiency would be increased; as if a service is popular, a good class of man is attracted to it. There are a few other matters which hardly come into the scope of this essay, but which it will not be amiss to refer to.

All arsenal appointments, adjutants of militia and volunteers, would be given to captains or subalterns of not less than nine years' service. The Mountain Artillery would be reserved (as indeed it is now) for officers of the Garrison Artillery, and their claims would be considered whether serving at home, in the colonies, or elsewhere. Mountain Battery officers would be mainly recruited from India, as the service in the land forts there is less attractive and less up-to-date than service on the sea fronts, but everyone should have a chance, and because a man is sent, perhaps against his will to the West Indies, he should not be cut off from service in a Mountain Battery, a service for which, perhaps he is well fitted. Again, the practice of shipping off slack or undesirable officers to out-of-the-way stations, must be very wrong. Surely such a man should be kept under the eye of authority at a big station, till he improves or leaves the service.

Position of the Garrison Artillery in the Regiment.

The position of the Garrison Artillery is improving every day. There was a day when the Corps of Royal Engineers was so little thought of that the men at the bottom of the term leaving the Academy were ordered to go into it. That day has passed and now we see the Sappers chosen from the top of every term. There was a day when the Garrison Artillery was a despised and neglected service, but that day has passed.

The day is in the near future when, with the Garrison Artillery as with the Engineers, the increased pay will bring home influence to bear, and commissions in the Garrison Artillery will be eagerly sought for and given to those at the top of the list. The officer who passes through the Garrison to the Field Artillery will cease to exist.

Position of Garrison Artillery in the Army.

Before closing, let us regard the position which the Garrison Artillery occupies with regard to the rest of the Army, and it will be seen that it is of vital importance that anything which tends to increase its efficiency should be done, and done at once. It is an accepted fact that the Navy is the first line in the defence of the empire. Articles are written daily to impress on the public that we are dependent on it for our very existance, and that defeat at sea means starvation to the British Islands within a few weeks.

Every European complication calls forth more ships, their equipment is hurried on, and improvements rapidly introduced. It was a fact commented on by all, that at the 1897 Jubilee Review, practically all the ships had been built since 1887. But all these ships are powerless without coal and of very evanescent use without dockyards to put into and arsenals to refit at. These coaling stations, dockyards and arsenals, depend on the Garrison Artillery for their defence. It is therefore a fair thing to say that the Garrison Artillery, if not part of the first line is at least the very front rank of the second line. As such its requirements and efficiency should take precedence of all other branches of the army.

It is no doubt an excellent thing to train up the cavalry and infantry and have them ready to start for a small expedition, or prepared to take a very minor part in some European war. But the Garrison Artillery stands on an absolutely different footing; its efficiency concerns the vital interests of our empire as it is; and with the Navy, on it depends the fact of our very existence. Its rôle is not showy. The German Emperor comes to Aldershot and sees nothing of it. The foreign ambassadors crowd to our great Naval reviews and scarcely realise that it exists; but in every corner of the earth, from Hong Kong to Mauritius, from Bermuda to the Thames, the Garrison Artillery stands armed and waiting, guarding the dockyards and arsenals, the coal-yards and harbours, and "when the strong man armed keepeth his palace his goods are in peace."

AUTO-SIGHTS.

POSSIBLE ERRORS DUE TO NON-VERTICALITY OF PIVOT.

BY

MAJOR M. O. HOPKINS, R.A.

RECENTLY I had occasion to calculate to what extent the range would be affected by want of level in the base-plate in the case of Q.F. guns fitted with automatic sights. And one of the guns for which I worked this out was a 6″ Q.F. at a height of 50 feet with a muzzle velocity of 1,882 f.s

Calculating to the nearest yard, I found that in this case the errors in range which would arise from a want of level of 4′ in the base-plate would be those shown in the following tabular statement:—

	Error.	
Range.	Mounting Depressed.	Mounting Elevated.
1000	+ 33 yards	−31 yards.
2000	+ 278 yards	−200 yards.
3000	+ 752 yards	−474 yards.
4000	+ 1512 yards	−833 yards.

These figures differ very much from those given by Colonel H. S. S. Watkin, C.B., in the R.A.I. "Proceedings" of last June, and in a less degree, those for 4,000 yards, from the results arrived at by Colonel Sir G. S. Clarke, K.C.M.G. which were published in the "Proceedings" for March of this year.

Whether my calculations are correct or not, I venture to publish them as a step towards the solution of a problem which is of the greatest importance to all Garrison gunners. For, however truly base-plates and roller paths may be laid, they cannot always remain level; and there can be no doubt that a trifling want of level in them will cause great errors in range.

The required corrections for these errors cannot be put into the correction for the error of the day, since they will vary with the line of fire. In the majority of cases a Q.F. gun would have to follow the enemy's vessel through a large arc of fire. Such an arc might extend to 180°, and if the gun were a 6″ Q.F. at the height of 50 feet and there happened to be an initial want of level of 4′ when the first round was fired at a range of 4,000 yards, the last round being fired at the same range as the vessel passed out of arc, the corrections would vary with the range and training between + 1,512 and − 833, always supposing that my theory and calculations are correct.

They are as follows :- –

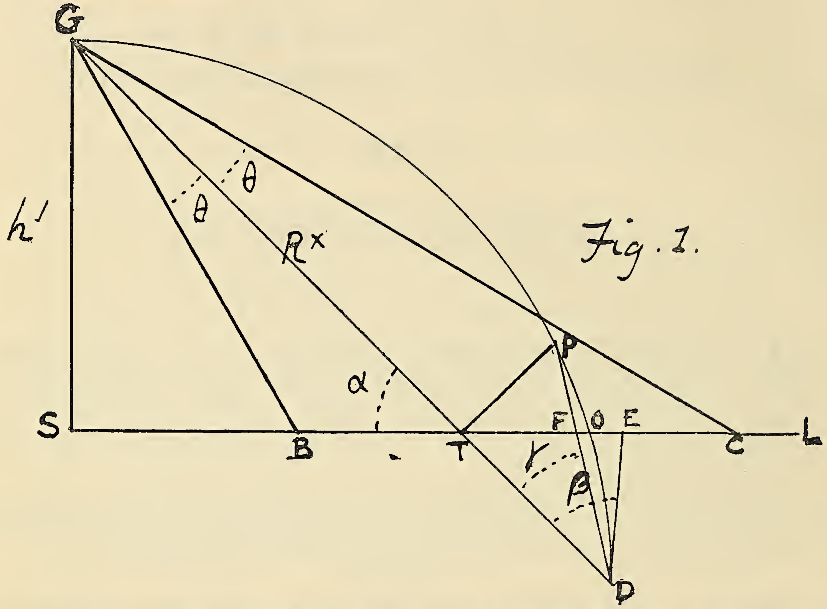

Fig. 1.

Let G, an automatically sighted gun at a height GS, or *h′* feet, above SL, the sea level, be correctly laid on T, a target which is at a range GT, or R yards. Then the trajectory will pass through T ; that is the gun will have the tangent elevation due to R. If the target now moves to another position, C ; such that the line of sight in following it has to be raised (Fig. 1.) or depressed (Fig. 2.) through any angle θ, the trajectory will pass through C and the gun will have the tangent elevation due to the range GC. In other words if, when the gun has

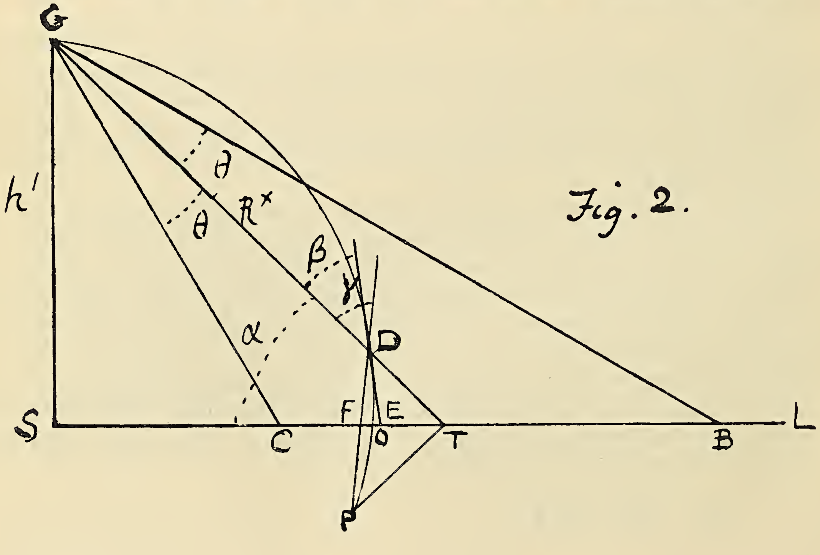

Fig. 2.

the tangent elevation due to R, (*h* being a constant) the line of sight is altered through θ the gun will thereby have imparted to it the tangent elevation due to GC.

Let the gun be again correctly laid on T, and suppose the whole mounting to be tilted either to the front (Fig. 1.) or to the rear (Fig. 2) along the line of fire through the angle θ. The line of sight will then become GB, but the tangent elevation will remain that due to R; and to bring the line of sight back to T, the gun-layer must move it through θ. In so doing he must inevitably impart to the gun the tangent elevation due to GC.

Make GD equal to GC; then, theoretically, when the line of sight is again on T, the trajectory will pass through D. Let the curve which (produced in Fig. 2.) cuts SL in O represents this trajectory. Then, when the range is R and the want of level is θ, TO is the resultant error measured along the sea level—as we invariably calculate errors in range.

Now, I cannot find the value of TO directly; but I can arrive at a very close approximation to it, in this way: from D with the angle of descent due to the range GC (or the angle β) lay off DE to cut SL in E, and through T erect a perpendicular to cut the trajectory in P. Join PD, cutting SL in F.

It is obvious that O must lie between E and F, and EF is very small. Calculating it out for the ranges and for the conditions named, I found that its maximum value was 14·7 yards; and that this was when the range was 4,000. If, then, we assume that TO is the mean of TE and TF, we must up to 4,000 yards be within considerably less than 8 yards of its actual value. It only remains to find TE and TF.

The angle GTS, or the range finding angle, is known since its sine $= \frac{h}{3\,R}$; the angle β is given in the range tables, and θ is assumed to be $4'$. Let us call the range finding angle α, and assign to R any value.

$$\text{Then GD} = \text{GC} = \frac{\text{R}\sin\alpha}{\sin(\alpha-\theta)}\ (\text{Fig. 1.})$$

$$\text{or}\qquad \frac{\text{R}\sin\alpha}{\sin(\alpha+\theta)}\ (\text{Fig. 2.}) = \frac{h}{3\sin(\alpha\pm\theta)}$$

$$\text{and TD} = \text{GD} - \text{R (Fig. 1.)},$$

$$\text{or}\qquad \text{R} - \text{GD (Fig. 2.) and TE} = \frac{\text{TD}\sin\beta}{\sin(\alpha+\beta)}$$

Next, TP $= \frac{1}{2}\,gt\,(\text{T}-t)$ where T and t are the times of flight due to the ranges GC and R, T being always the greater. Thus, TP being known, the angle TDP (which we will designate γ) can be found from the equation:

$$\tan \gamma = \frac{TP}{TD} \qquad \text{and } TF = \frac{TD \sin \gamma}{\sin (\gamma + \alpha)}$$

Finally it is assumed that $TO = \frac{TE + TF}{2}$

It will be noticed that I have taken GT and GC instead of ST and SC as the ranges to T and C, and that I have calculated from its sine instead of from its tangent. But this method though unusual, can only tend to greater accuracy.

NOTE BY COLONEL SIR G. S. CLARKE, K.C.M.G., F.R.S., R.E.

Superintendent of the Royal Carriage Factory.

When a new adjunct of Coast Defence is placed in the hands of the Royal Artillery, I think it is undesirable that confidence should be shaken at the outset. If a dog obtains a bad name, we know what follows, and should a presuming and incompetent mongrel thrust itself upon the notice of the very "fierce dogs" of the Garrison Artillery a tragedy must inevitably be enacted. For this reason only I ventured to reply to the excellent paper of Colonel H. S. S. Watkin, c.b.,* and I now offer a few remarks on Major Hopkins's able analysis of one probable source of error which as I have already stated "any auto-sight inventor must evidently face."

Major Hopkins has quite correctly calculated the errors arising from an inclination of the axis of the mounting although, as Professor Greenhill points out, the process is somewhat unnecessarily laborious. I take exception, however, to the claim that this paper is "a step towards a solution of a problem which is of the greatest importance to Garrison Gunners." It seems to me to be an alarming but perfectly fair statement of a serious source of error unaccompanied by the vestage of a hint as to how that error may be met. In designing an auto-sight for service use, one of the earliest measures I took was to investigate fully the errors due to non-verticality of pivot. The formula which Professor Greenhill gives was the one adopted for the purpose, and it was evident from the first that (1). Verticality must be attained in the original laying of the cast-iron pedestals which I introduced in order to secure rigidity; or (2) means of subsequent adjustment must be provided; or (3) the sight itself must be capable of such manipulation as to give the necessary corrections. One of these three conditions must be fulfilled, or practical success in firing at a rapidly moving target could not be expected. I have explained* that verticality is not essential to accurate practice at a fixed target, or when firing over a small arc of training. A limitation of this kind was, however, clearly inadmissable if the auto-sight was to be of real to the Garrison Artillery, and the most careful consideration was, therefore, bestowed upon the problem of adjustment.

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* R.A.I. "Proceedings", Vol. XXV., No. 6, "Automatic Sighting." By Colonel H. S. S. Watkin, c.b., R.A.

Practical experience of a varied kind was so far shown that sufficient verticality can be secured to give admirable shooting. In my paper on "Auto-Sighting", I gave some results of rapid fire with a 4·7″ quick-firing gun. The Director-General of Ordnance has very kindly permitted the publication of some further figures. (See Appendix A.)

Independent trials of my auto-sights have taken place at four widely dispersed stations with results such as these and in not a single case has any special levelling or adjusting device been employed. In practice, which after all is the real test, the terrible errors which Major Hopkins shows to be possible have never arisen. To all officers who might well feel staggered by the possibility of an error of 1,512 yards in 4,000 yards, I venture earnestly to commend a study of the actual results obtained.

This, however, is not all. I am well aware that a bad foundation has to be reckoned with, and that displacement of the axis of motion of a mounting may occur. This is provided for, though I am not at liberty to explain the means.

Conditions (2) and (3) *can* be fulfilled, and experience will show which of two absolutely different mechanical arrangements is best suited for the requirements of the garrison gunner. Meanwhile I ask him to regard the figures at his disposal as evidence of what the auto-sight has already done, and to trust his new adjunct. Still better results will be obtained when the use of the sight has become familiar. The verticality of the axis question is a bugbear which, like others of the species, shrivels when one goes up to it. I believe it is not too much to say that auto-sighting will add 50% to the efficiency of the fire of coast artillery.

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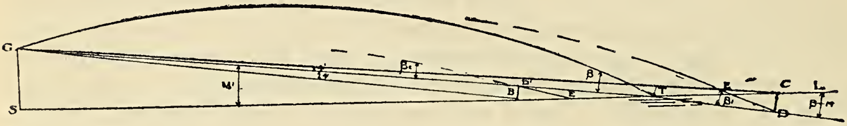
* R.A.I. "Proceedings," Vol. XXVI., No. 8, "Auto-Sighting." By Colonel Sir G. S. Clarke, K.C.M.G., F.R.S., R.E.

NOTE BY PROFESSOR A. G. GREENHILL, M.A., F.R.S.

Professor of Applied Mathematics at the Ordnance College.

The mathematical treatment of this subject is quite correct, but a little more laborious than is necessary. I think TO may be replaced by TE, in the author's figure 1, with sufficient accuracy for practical purposes, provided the suitable value of β is chosen.

Fig. 3.



If the pivot leans forward 4′, and the sight is directed on the target T, the automatic sight will give the elevation requisite for the range GC, so that the trajectory will be GED, where GD = GC.

Drawing DE, making the angle TDE equal to β_1 the range table angle of descent at the range GC or GD to cut the sea level SL is E, then E may be taken with sufficient accuracy as the point where the shot strikes the water, and the error in range is

$$\mathrm{TE} = \Delta_1\mathrm{R}\ (+)\ \text{suppose}.$$

Then

$$\Delta_1\mathrm{R} = \mathrm{TE} = \mathrm{TD}\,\frac{\sin\beta_1}{\sin(\beta_1+\mathrm{M})}\ [\text{and TD} = \text{TC}]$$

$$= \mathrm{TC}\,\frac{\sin\beta_1}{\sin(\beta_1+\mathrm{M})}$$

$$= \frac{\mathrm{T}t}{\sin(\mathrm{M}-4)}\,\frac{\sin\beta_1}{\sin(\beta_1+\mathrm{M})}$$

$$= \mathrm{GT}\,\frac{\sin 4'\sin\beta_1}{\sin(\mathrm{M}-4)\sin(\beta_1+\mathrm{M})}$$

and GT = R, while the sines may be replaced by the angles, all expressed in minutes, so that

$$\frac{\Delta_1\mathrm{R}}{\mathrm{R}} = \frac{4\times\beta_1'}{(\mathrm{M}'-4')(\beta_1'+\mathrm{M}')}$$

and the percentage error is

$$100\,\frac{\Delta_1\mathrm{R}}{\mathrm{R}} = \frac{400\,\beta_1}{(\mathrm{M}-4)(\beta_1+\mathrm{M})}\ \%.$$

$$= \frac{400\,\beta}{(\mathrm{M}-4)(\beta+\mathrm{M})}$$

taking β and β_1 as practically undistinguishable.

So also, if $\Delta_2 R$ denotes the error (—) is range R, when the pivot leans backward 4′,

$$\frac{\Delta_2 R}{R} = \frac{4 \times \beta_2'}{(M + 4)\ (\beta_2 + M)} = \frac{4\ \beta}{(M + 4)\ (\beta + M)}$$

This from the Range Table of the 6-in. Q.F. gun, Muzzle Velocity, 1,882 feet per second.

Range.	1000 yards.	2000 yards.	3000 yards.	4000 yards.
β	57′	138′	258′	404′
$M = 1146\,\frac{h}{R}$	57′	29′	19′	14′
$\beta + M$	114′	167′	277′	418′
$M - 4$	53′	25′	15′	10′
$M + 4$	61′	33′	23′	18′
$100\ \frac{\Delta_1 h}{R}$	3.7°/o	13°/o	25°/o	38°/o
$= \frac{400\ \beta}{(M-4)(\beta+M)}$ $\Delta_1 h$	37 yds (33)	260 yds (278)	750 yds (752)	1520 yds (1512)
$100\ \frac{\Delta_2 h}{h}$	3.5°/o	10°/o	16°/o	21°/o
$= \frac{400\ \beta}{(M+4)(\beta+M)}$ $\Delta_2 h$	33yds (31)	200 yds(200)	480 yds(474)	840 yds(833)

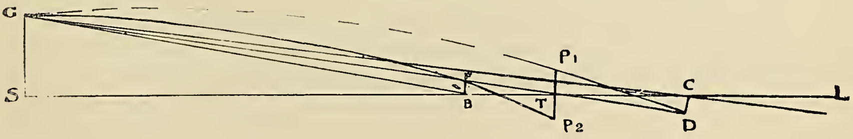
The agreement between these results and those given by the author is sufficiently close for practical purposes.

Astronomers are careful to give the corrections required for errors of adjustment in their instruments, so gunners need not be afraid to make a similar careful survey of the corrections unavoidable in manufacture, for such delicate adjustments as those required with automatic sights.

I think the author should examine explicitly the error on a *vertical* target due to want of level of the base-plate, as this error is of more practical importance than the error of range.

This vertical error is practically the author's TP in his Fig. 1; and

Fig. 4.



in Fig. 4, $TP_1 = 16tt_1$ feet, where t_1 is the extra time of flight for the range GC; while $TP_2 = 16tt_2$ feet, where t_2 is the defect in time of flight for the range GB, t denoting the time of flight for the real range GT.

$$\frac{GC}{GT} = \frac{\sin M}{\sin (M-4)} = \frac{M}{M-4}; \quad \frac{GB}{GT} = \frac{M}{M+4}; \quad M = \frac{1146\,h.}{R}$$

This vertical error becomes serious at ranges of 3000 yds. and over; but I do not think it was ever intended that the automatic sight should be employed at these long ranges with such a small command as 50 feet. The correction for tide level would now become of equal importance; and Major Dunlop points out that the two corrections for tide level and for level of base plate, can be carried out in the same manner.

Range $G\ T$.	1000 yards.	2000 yards.	3000 yards.	4000 yards.
M	57	29	19	14
$M - 4$	53	25	15	10
GC	$\frac{57}{53} \times 1000$	$\frac{29}{25} \times 2000$	$\frac{19}{25} \times 3000$	$\frac{14}{10} \times 4000$
	= 1075 yds.	= 2320	= 3800	= 5603
(From Range Table) $t + t_1$	1.83s	4.43	8·25	13·4
t	1.73	3·73	6·10	8·0
t_1	0·1	0.7	2·15	5·4
log t	0·2380	0·5717	0·7853	0·9031
log t_1	$\bar{1}$·0000	$\bar{1}$·8451	4·3324	0·7324
log $\frac{1}{2}g$ = log 16	1·2041	1·2041	1·2041	1·2041
log TP_1	0·4421	1·6209	2·3218	2·8396
TP_1	2·768 ft.	41·78	209·8	691·1 ft.
M	57	29	19	14
$M + 4$	61	33	23	18
GB	$\frac{57}{61} \times 1000$	$\frac{29}{33} \times 2000$	$\frac{19}{23} \times 3000$	$\frac{14}{18} \times 4000$
	= 935 yards.	= 1760 yards.	2500 yards.	3100 yards.
(From Range Table) $t - t_2$	1·63	3·17	4·86	6·36
t	1·73	3·73	6·10	8·0
t_2	0·1	0·56	1·24	0·64
log t	0·2380	0·5717	0·7853	1·9031
log t_2	$\bar{1}$·0000	$\bar{1}$·7482	0·0934	0·2148
log 16	1·2041	1·2041	1·2041	1·2041
log TP_2	0·4421	1·5240	2·0828	2·3220
TP_2	2·765	33·42	121·1	209·9 ft.

NOTE BY MAJOR H. C. DUNLOP, R.A.

Professor of Artillery at the Ordnance College.

If E denotes the error due to laying or that in the level of the racers, Professor Greenhill's first formula becomes

$$(1).\qquad \frac{\Delta R}{R} = \frac{\mp E B}{(M \pm E)\,(B + M)}$$

At long ranges where B is large as compared with M it becomes

$$(2.)\qquad \frac{\Delta R}{R} = \frac{\mp E}{M \pm E}$$

which is the formula for a depression range finder or position finder out of level or badly laid.

Again if p is the percentage too low or too high of the setting of the tide lever, and if there is no error in the racers or laying, the formula becomes

$$(3).\qquad \frac{\Delta R}{R} = \frac{\pm p M B}{\{M\,(100 \pm p)\}\,(B + M)} = \frac{\mp p B}{(100 \pm p)\,(B + M)}$$

At long ranges where B is large as compared with M this becomes

$$(4).\qquad \frac{\Delta R}{R} = \frac{\mp P}{100 \pm p}$$

which is the formula for a Position Finder or Depression Range Finder with a similar error in the setting of the height.

Now formulæ (2) and (4) are always greater than formulæ (1) and (3). In other words such errors as we have considered affect a position finder or depression range finder more than an auto-sight. It is well known that they affect ordinary laying less. But we must remember that an auto-sight combines range finding and laying, so that, when considering its errors, we must compare them with all the errors resulting from the combined use or a depression range finder *and* the ordinary laying appliance. There are then so many errors and so many corrections and sometimes so many cooks that it is doubtful if there can be any satisfactory test except hits at practice. It is quite certain that, though in helping to trace the causes of misses they have their uses, formulæ and figures can prove anything except the probability of the assumptions or the reliability of the statistics on which they are based. We require an enormous mass of such circumstantial evidence before we can hope even to approach the truth, but direct hits are direct evidence and credible.

APPENDIX A.

SOME TYPICAL RESULTS OF ACTUAL PRACTICE WITH AUTOMATIC SIGHTS.

With 6″ Quick-Firing Gun.

Time.	Range.			Tide above or below mean tide level.	Correction on drum.	Deflection	Results judged by Range Officer. + or −	Remarks.
	D.R.F.	P.F.	On drum					
				Height of gun above mean sea level = 301 feet.				
	yards	yards	yards	+ − feet	yards	mins.	yards	
					2,000 yards. Automatic sight with telescope. Deliberate.			
p.m.								
4.15.50	1,925	...	1,900	−0′ 6″	Nil.	2 R	Hit.	Wind force, about 2.
4.16.	1,925	...	1,900	−0′ 6″	Nil.	2 R	+10	Sea Smooth.
4.16.10.	1,925	...	1,900	−0′ 6″	Nil.	2 R	+10	Target drifting slowly.
4.16.30.	1,875	...	1,800	−0′ 6″	Nil.	2 R	−10	
4.16.55	1,775	...	1,750	−0′ 6″	Nil.	2 R	Hit.	Electric firing gear used.
					2,000 yards. Automatic sight with telescope. Rapid			
4.18	2,030	...	2,000	−0′ 6″	Nil.	2 R	Hit.	Wind force, about 2.
4.18.8	1,975	...	1,950	−0′ 6″	Nil.	2 R	−20	Sea smooth. Target drift-
4.18.30	1 925	...	1,900	−0′ 6″	Nil.	2 R	+20	ing. Time, 52 seconds.
4.18.35	1,975	...	1,950	−0′ 6″	Nil.	2 R	+10	Whole of target knocked
4.18.50	1,975	...	1,950	−0′ 6″	Nil.	2 R	Hit.	away. Fire continued on
								platform which formed a
								fairly good objective.
					3,000 yards. Automatic sight without telescope. Delib rate.			
3.1.39	2,965	2,990	2,825	−1′ 0″	Nil.	Nil.	−60	Wind (gusty) 4. Sea chop-
3.1.55	2,980	3,010	2,900	−1′ 0″	Nil.	Nil.	−20	py. Hazy at times.
3.2.10	2,985	3,010	2,975	−1′ 0″	Nil.	Nil.	Hit.	Target, broken up.
3.2.22½	2,990	3,020	2 975	−1′ 0″	Nil.	Nil.	+30	
3.2.37	3,000	3,025	3,000	−1′ 0″	Nil.	Nil.	+40	
					3,000 yards. Automatic sight without telescope. Rapid.			
3.4.5	3,060	3,080	3,400	−1′ 0″	Nil.	Nil.	Range	Wind 2. Sea choppy.
3.4.18	3,070	3,090	3,400	−1′ 0″	Nil.	Nil.	+300	Hazy at times.
3.4.30	3,075	3,100	3,375	−1′ 0″	Nil.	Nil.	+250	Knocked target over. Lay-
3.5.45	3,120	3 150	3,275	−1′ 0″	Nil.	Nil.	+ 20	ing not altogether reliable
3.6	3,125	3,150	3,275	−1′ 0″	Nil.	Nil.	+ 20	as target was now a bad
								objective, only small por-
								tion left. Time, 40 sec's.
					4,000 yards. Automatic sight with telescope. Rapid			
4.34.10	3,815	3,860	3,800	−2′ 0″	Nil.	8 L	+20	Wind 2. Sea choppy
4.34.22	3,820	3,860	3,800	−2′ 0″	Nil.	8 L	+30	Hazy at times.
4.34.32½	3,820	3,860	3,825	−2′ 0″	Nil.	8 L	+50	Target, drifting.
4.34.43½	3,820	3,870	3,825	−2′ 0″	Nil.	8 L	+40	Time, 44 seconds.
4.34.54	3,820	3,890	3 825	−2′ 0″	Nil.	8 L	+15	
11.18.38	4,125	4,140	4,200	+1′ 6″	Nil.	15 L	+30	Wind 6. Raining at inter-
11.18.48	4,125	4,140	4,200	+1′ 6″	Nil.	15 L	+80	vals.
11.18.58	4,130	4,140	4,200	+1′ 6″	Nil.	10 L	+50	Target towed six miles an
11.19.8	4,130	4,140	4,150	+1′ 6″	Nil.	10 L	+30	hour. Target somewhat in-
11.19.19	4,130	4,140	4,100	+1′ 6″	Nil.	10 L	+20	distinct at times, owing to
11.19.28	4,130	4,140	4,125	+1′ 6″	Nil.	10 L	+40	spray being blown back
11.19.38½	4,125	4,140	4,200	+1′ 6″	Nil.	10 L	+30	over it.
11.19.58	4,120	4,140	4,150	+1′ 6″	Nil.	10 L	Hit.	Breech jammed, causing 30
11.20.11	4,120	4,150	4,200	+1′ 6″	Nil.	10 L	+40	seconds delay, and force
11.20.34	4,130	4,160	4,200	+1′ 6″	Nil.	10 L	+50	used in opening it threw
11.20 47	4,140	4,160	4,200	+1′ 6″	Nil.	10 L	+70	gun right off target.
11.20.57	4,150	4,160	4,225	+1′ 6″	Nil.	10 L	+100	Breech jamming possibly
11.21.10	4,150	4,170	4,200	+1′ 6″	Nil.	10 L	+70	caused by metal washer
11.21.20	4,150	4,170	4,170	+1′ 6″	Nil.	10 L	Hit.	from electric primer drop-
11.21.32	4,150	4,170	4,200	+1′ 6″	Nil.	10 L	Hit.	ping out of empty cart-
11.21.51	4,150	4,180	4,200	+1′ 6″	Nil.	10 L	+50	ridge case.
11.22.1	4,160	4,190	4,200	+1′ 6″	Nil.	10 L	+60	Several of these washers
11.22.12	4,160	4,190	4,200	+1′ 6″	Nil.	10 L	Hit.	were found lying in breech
11.22.23	4,170	4,190	4,200	+1′ 6″	Nil.	10 L	Broke up.	screw during practice. Gun
11.22.35	4,170	4,190	4,275	+1′ 6″	Nil.	10 L	+120	became so hot that the rain
11.22.47	4,175	4,200	4,300	+1′ 6″	Nil.	10 L	+130	caused the gun to steam
11.22.55	4,175	4,190	4,250	+1′ 6″	Nil.	10 L	+110	and may have interfered
11.23.8.	4,180	4,190	4,200	+1′ 6″	Nil.	10 L	Hit.	with laying.
11.23.19	4,180	4,200	4,200	+1′ 6″	Nil.	10 L	+30	Mud from parapet was
11.23.30	4,180	4,200	4,150	+1′ 6″	Nil.	10 L	+25	blown back inconvenienc-
11.23.40	4,180	4,190	4,150	+1′ 6″	Nil.	10 L	+15	ing the Battery Command-
11.23.50	4,180	4,180	4,150	+1′ 6″	Nil.	10 L	Hit.	er and detachment.
11.24.1	4,180	4,190	4,175	+1′ 6″	Nil.	10 L	Hit.	Round 150 broke up on
11.24.12	4,180	4,190	4,175	+1′ 6″	Nil.	10 L	Hit.	leaving the bore.
11.24.23	4,180	4,190	4,200	+1′ 6″	Nil.	10 L	+60	Time, 5 minutes, 45 secs.

APPENDIX B.

SOME TYPICAL RESULTS OF ACTUAL PRACTICE WITH AUTOMATIC SIGHTS.

With 4·7″ Quick-Firing Gun.

<table>
<tr><th colspan="2">Range.</th><th rowspan="2">Tide above or below mean tide level.</th><th rowspan="2">Correction on drum.</th><th rowspan="2">Deflection</th><th colspan="2">Result.</th><th rowspan="2">Remarks.</th></tr>
<tr><th>D.R.F.</th><th>On drum.</th><th>+
−</th><th>R. or L.</th></tr>
<tr><td>yards.</td><td>yards.</td><td>yards.</td><td>yards.</td><td>yards.</td><td>yards.</td><td>yards.</td><td></td></tr>
<tr><td colspan="8">At moving target, range 2,800—2,500 yards, rate about four miles an hour.</td></tr>
<tr><td colspan="8">Time, 6 minutes 30·6 seconds (delay of about 2½ mins. to pick up the target which the layer had lost and which could not be seen with the naked eye).</td></tr>
<tr><td colspan="8">Time not taken owing to delays in finding the target.</td></tr>
<tr><td colspan="8">Height of Gun above mean sea level 161½ feet.</td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>+50</td><td>5 R</td><td></td><td></td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>+35</td><td>5 R</td><td></td><td></td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>Range</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>+20</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>+15</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>+ 5</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>+10</td><td>...</td><td>Hit.</td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>− 3</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>+ 5</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>+15</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>+10</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>..</td><td>−15</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>−15</td><td>...</td><td></td></tr>
<tr><td>..</td><td>...</td><td>..</td><td>...</td><td>. .</td><td>Range</td><td>...</td><td>Hit.</td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>−50</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>−20</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>− 7</td><td>...</td><td></td></tr>
<tr><td>.</td><td>...</td><td>...</td><td>...</td><td>..</td><td>−50</td><td>...</td><td>Front flag knocked away 5th round, and barrel knocked away at 12th round.</td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>..</td><td>+ 7</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>+10</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>+ 1</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>.</td><td>+ 2</td><td>...</td><td>Rear of target laid on for remainder of series.</td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>.</td><td>− 5</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>..</td><td>−40</td><td>...</td><td></td></tr>
<tr><td colspan="8">Height of Gun above mean sea level 138½ feet.</td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>..</td><td>−20</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>−10</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>−90</td><td>...</td><td></td></tr>
<tr><td>..</td><td>...</td><td>...</td><td>...</td><td>...</td><td>+60</td><td>...</td><td></td></tr>
<tr><td>. .</td><td>...</td><td>...</td><td>...</td><td>...</td><td>−10</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>Range</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>..</td><td>...</td><td>+ 2</td><td>...</td><td></td></tr>
<tr><td>..</td><td>...</td><td>...</td><td>...</td><td>.</td><td>− 3</td><td>...</td><td></td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>− 7</td><td>...</td><td></td></tr>
</table>

Corrigenda: Page 437, line 13, *for* 'Appendix A.' *read* 'Appendices A. and B.'

THE "DICKSON MEMOIRS."

BY

MAJOR R. H. MURDOCH, late R.A.

THE "Dickson Memoirs" are collections of MSS. (copies and originals), maps and books, beginning with *temp.* Ed. I., 1294, and ending with 1856. They were collected and compiled by 𝔚𝔄 Major-General Sir Alexander Dickson, K.C.B., K.H.,. who was commissioned into the Royal Artillery in 1794 (No. 844 in "Kane's List"); also by his son 𝔙ℭ General Sir Collingwood Dickson, G.C.B., who was commissioned into Royal Artillery in 1835 (No. 1874 in "Kane's List"). Those by the former close at 1840 (the year in which Sir Alexander died); while those by the latter extend from the period of the Carlist War, 1837, to the Siege of Sevastopol, 1856.

The whole are contained in four boxes—three of MSS. relating to Artillery, and one of professional maps, books, and plans of fortifications, etc.

These were presented to the Royal Artillery Institution in 1894 through His Royal Highness The Duke of Cambridge, K.G., etc., Colonel-in-Chief of the Regiment, by the subjoined letter:—

R.A.
83
11

Horse Guards, War Office
7th July, 1894.

Sir,—

"I am desired to acquaint you, for communication to the President "of the Royal Artillery Institution, that the Commander-in-Chief has "been pleased to accept, on behalf of the Regiment, the gift by General "Sir C. Dickson, 𝔙ℭ G.C.B., of a collection of letters, journals, and "historical records connected with the Royal Artillery during the "XVII., XVIII., and XIX. centuries—collected by his father, the late "Major-General Sir A. Dickson, and by himself.

"His Royal Highness has decided that the most convenient course "will be to entrust this collection to the custody of the Committee of "the Royal Artillery Institution, requesting them to use their best en-"deavours to obtain the services of an officer willing and qualified to "edit them with a view to publication; and I am to request you will give "the necessary directions for the transfer of these papers from the (tem-"porary) charge of the Royal Artillery Record Office, Woolwich, to the "Institution accordingly."

I have, etc., F. T. Lloyd, D.A.G.

The General Officer
Commanding the Troops, Woolwich.

The Committee having, in August last, done me the honor of entrusting to me the collating and editing of the "Dickson Memoirs," with the stipulation that the task be completed within two years, a brief general outline of the result of cursory examination of the nature and extent of the ground covered by the "Memoirs" and of their *rôle* in relation to archives of artillery may be not without present interest.

From the date of his being commissioned into the Royal Artillery (1794), from Cadet of the Royal Military Academy, until the year of his death (1840), Sir Alexander Dickson had continued to compile Journals and to preserve M.S.S. relating to all artillery affairs within his personal cognisance and experiences; and these may be grouped as series B and C—the former including service at Gibraltar, the last siege and capture of Minorca, expeditions to Egypt, Buenos Ayres, Monte Video, and events which led to his embarkation for the Peninsular in 1809, when Wellesley (afterwards Duke of Wellington) was given command of the Army in the field after the disastrous expedition under Sir John Moore; and the B series to the Artillery of the Peninsular Campaigns to 1814, the War in America (1814), the battle of Waterloo, and the closing incidents of the Army of Occupation in France, 1816.

From 1816 to 1840 there was but one Artillery officer (Sir Alexander Dickson) whom the Duke of Wellington consulted—directly, or through the Military Secretary, Lord Fitzroy Somerset—on matters of Royal Artillery *personnel* or *matériel*; and this circumstance gave occasion for Sir Alexander's posting himself up in everything relating to Artillery in the past as well as to everything Artillery in the then present—the former comprised in series A and the latter (to 1840) in series D..

These are supplemented by MSS. preserved by General Sir Collingwood Dickson—grouped as series E—from 1837 to 1856, and include services in the Carlist War 1837-9, and in Turkey and the Crimea continuously from 1840 to 1856.

The A series will thus include the period to 1794 from temp. Ed. I. (1294) and Ed. VI. (1547).

The B series will thus include the period to 1809-10.
The C " " " " to 1818..
The D " " " " to 1840.
The E " " " " to 1837-1856.

When, in 1818—owing to the force of circumstances already explained—it became known that Sir Alexander had conceived the idea of collecting and arranging Artillery data not only from its organisation as a Regiment in 1715, but from the earliest times down to 1794 (when his own Artillery services began), it is apparent that an officer of his unique position and influence had many willing co-adjutors both civilian officials and gunner officers—who placed also at his disposal their individual fragmentary collections, in addition to which he jotted down from time to time notes of his desultory reading in Authors; and even in series B are to be found MSS. from brother officers with whom he served, relating *p.e.*, to the Siege of Copenhagen, and the expeditions to Buenos Ayres and Monte Video.

Series C and D are wholly compiled by Sir Alexander, and include topics of confidential and delicate personal and professional nature, which will have to be treated with much discrimination—a reservation which will perhaps equally apply to the diplomatic portion of series E relating to Royal Artillery officers in professional and international incidents during the military Anglo-Turkish events from 1840 to the outbreak of the Crimean War.

The ultimate value of the "Dickson Memoirs" in adding to or confirming data for Artillery history—in particulars or generals—cannot of course, be predicated or determined until the work of collating and editing them shall have been completed; and may be enhanced or marred according to the capacity and faithfulness of the editor.

THE TRAINING & EMPLOYMENT OF A HOWITZER FIELD BATTERY.

BY

MAJOR A. H. GORDON, R.F.A.

[The howitzer is technically not a gun, but in every day barrack square life it is called one, and moreover in all words of command the use of the latter word is authorised. Any attempt to enforce the use of the word "howitzer" in place of "gun" is, from the very nature of the words themselves, doomed to failure and may as well be abandoned at once. In the following paper the word "gun" is, therefore, frequently employed. A.H.G.].

FOR the first time a complete brigade division of howitzer batteries, has this year, been to Okehampton for practice. The general results were very satisfactory and in some respects, such as rapidity of fire and the use of observing parties, even more was achieved than had been expected. For example, the average* "battery fire" interval of one battery was 11.06 seconds, 10 seconds being ordered. Again, when firing from behind cover and using an observing party to range with, about 2,000 yards to a flank, out of 44 shells fired, 25 fell in the target,† the range being 3550 yards.

As the method of training howitzer batteries differs in some respects from that of other batteries, the following notes on the system adopted in one of them may be of interest.

2.—It is known that the authorities consider that howitzer batteries will only be employed under special conditions, that the targets at practice are earthworks, batteries in action and troops behind cover and that no moving targets are used. All this is therefore constantly kept in view throughout the training; should any change take place and the contemplated rôle of howitzer batteries on the battle-field be enlarged, a corresponding change in the system of training would become necessary. But in the meantime, the training is arranged to meet the known conditions and to develope the following points in particular, the more important muscles as it were, of the howitzer body, viz.: Clinometer laying, the use of aiming posts and deflection, observation by the Battery Commander, the use of observing parties, rapidity of drill, the employment of full detachments from the first, and double manning in running up.

3.—Taking these points in succession:—

Clinometer laying.—As 10 degrees is the limit of tangent sight elevation, and as a Battery Commander would not risk having to change from tangent sight to quadrant elevation during ranging, it follows that clinometers must be used at all ranges above (say) 8 degrees.‡ Howitzers would as a rule be employed in the earlier stages of the fight and at long or medium ranges; we may therefore conclude that clinometers will almost invariably be used. Accurate clinometer laying is quite independent of the distinctness of the target; it is moreover far easier and more mechanical than tangent sight laying and will accordingly suffer less from the unequal excitement of different layers' nerves in action; ranging will, therefore, become more rapid when clinometers are used, which is a point of supreme importance in all Artillery practice at the present time. Special attention and time must therefore be devoted to clinometer laying.

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* In striking this average one series has been excluded in which 20 experimental fuzes were fired during battery fire, thereby causing interruption and therefore delay.

† A rectangle 150 yards by 50 yards, the longer side being at right angles to the line of fire.

‡ Even with full charge this is only 1,600 yards.

After weeding out by preliminary drills those men who give no promise of ever becoming layers, the remainder are given as much practice as the exigencies of garrison fatigues and employment will allow. As soon as a man is recommended by his section officer, his name is entered in the laying book, and from that day, every time he attends laying drill, the marks which he obtains are recorded in the book. The marks are awarded by an officer according to the test laid down in "Instructions for practice," for qualified layers, laying drill for this purpose being usually carried out during mid-day stables,* each man being tested only once a day and therefore only being required for a few minutes. The third subaltern usually has this duty to perform. When it becomes necessary to select the 18 badge layers, the average of the marks obtained by each qualified layer is published weekly for a short time before the selection, which is finally made from those who have the highest average, provided they have layed a large number of times. Men who have been unsteady in conduct (absent or drunk) are considered ineligible for badges. It is found that the men take the keenest interest in their weekly averages and the consequent emulation conduces to the best results. This system entails a considerable amount of work from the officers, but it ensures rapid, accurate and reliable laying.

4. *Aiming posts.*—When engaging an enemy superior in number of guns, armament or rapidity of fire, advantage will necessarily be frequently taken of the high trajectory of the howitzer by coming into action behind natural cover. In such a case the use of the clinometer is compulsory and must be supplemented by the proper employment of aiming posts.

The placing of aiming posts on undulating or rough ground requires considerable practice on such ground, the barrack square being quite useless for the purpose. The conditions to be fulfilled are:—

(*a*). A visual line from the gun must cut both posts.

(*b*). A visual line from the target must cut both posts.

(*c*). Subject to the above, the posts should be as nearly as possible 20 yards apart.

(*d*). Subject to the above the posts should be as far from the crest as possible.

(*e*). Subject to the above the posts should be not less than 30 yards from the gun.†

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* Employed men can often attend for a few minutes at this time.

† The guns will be placed as far from the crest as the nature of the ground, the requirements of a good platform and the position of neighbouring troops will allow.

Section officers and layers have therefore a great deal to attend to in placing the posts and only frequent practice on varied ground will enable them to perform this duty rapidly and well. If the reverse slope of the hill is steep, difficulty will be found in selecting a suitable position for the posts. In the diagram (see Fig. I.) the points K and L alone fulfill conditions (*a*) and (*b*), namely that both posts should be cut by the lines *mn* and *xy*, but condition (*c*) cannot be complied with and must be sacrificed. If however it is possible to select, instead of the target itself, a forward auxiliary mark which is at a higher level than the target, the ground available is at once enlarged and all the conditions can be met. If the posts are placed at R and S, they are both cut by the lines *m n* and *p q*, and are moreover 20 yards apart.*

The following additional advantages which result from the use of an auxiliary mark may be mentioned here. The operation of planting aiming posts can be carried out without attracting the enemy's notice; for, with the exception of the Battery Commander during the few seconds in which he is choosing his auxiliary mark and measuring the deflection, no one need show above the crest line or see the target. Complete surprise of the enemy, if desirable, can thus be ensured, and cover for the layers while placing their posts is also obtained. In the case of an ill-defined obscure target the use of a clearly visible auxiliary mark to the right or left of the target will give more rapid and accurate results than an attempt to point out to the section officers and layers a ranging point on the target itself.† When a ranging point is employed the interval between the pairs of aiming posts requires attention. If the battery is far from the posts and the range is short, the interval between the pairs of posts must be reduced by that fraction of 20 yards, which is represented by the proportion of the former measurement (distance of battery from posts) to the latter (range from the guns).

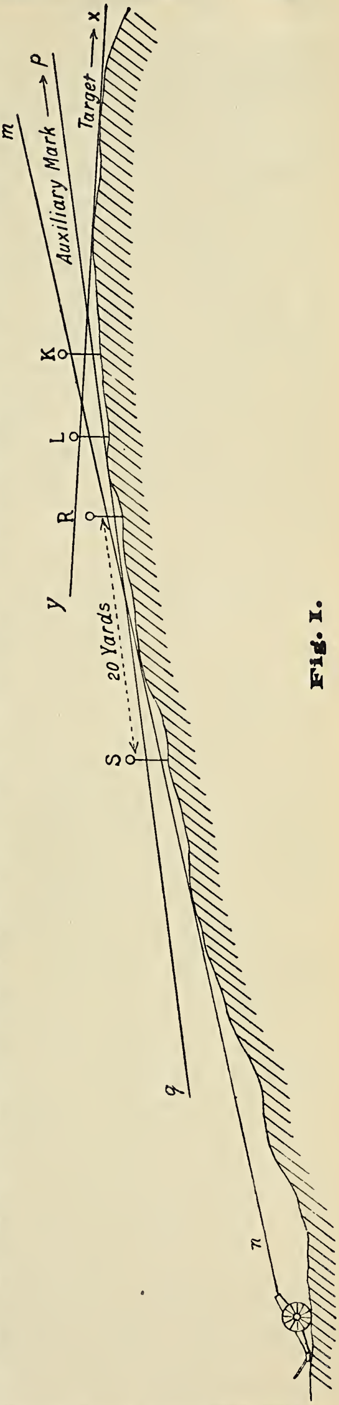

Fig. I.

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* The manner of using an auxiliary mark described in the handbook, would seldom be of any use for field howitzers; it is more suitable for siege work in which time is of little importance.

† At practice this year one battery used a forward auxiliary mark in four out of six series of battery practice.

In the method of placing aiming posts described later (see p. 459) this correction is not necessary. The usual method of placing aiming posts is employed while the battery is limbered up in a covered position and when the ground on which it is to come into action is smooth and firm. If however the position selected for the battery to come into action on is covered with boulders, bushes, or holes, it is advisable to use the alternative method described in the hand-book, using two men. But in this case the section officers after pointing out the target or auxiliary mark to their layers, must choose the exact platforms for their guns, indicating the platform of one gun by leaving their swords or head-dresses on it and marking the other themselves. As soon as the layers have planted their posts the section officers can go and check them after which the layers must be careful to stand on the exact places chosen for their guns. This method of planting posts (*i.e.*, with two men) is also used when the guns are already in action and a change of target is ordered. The change can be effected in about 30 seconds after the new target has been pointed out to the section officers and layers.

If the ground is open, the best method of coming into action on the layers has been found to be by " Action front " ; if " Action right " or " Left " is used it is very difficult for the No. 1 to judge his word of command so as to halt his gun exactly on his layer, especially when moving fast or on a slope. If "Action front" is used, it matters little if the gun is halted a yard or two short of or beyond the layer, it will in any case be on the line of fire. If the gun be driven to the left of the layer, who should be exactly covering his two posts, and if the off gun wheel (which becomes the left wheel in action) be steadied while the trail is carried round and the other wheel is well manned, it will be found that the gun falls exactly on to the line of fire. The position selected for the battery should be sufficiently far from the crest to give ample cover from view to the lead drivers when coming into action in this way.

5. *Deflection.*—Accurate fire from behind cover is dependent on a careful use of deflection. It must be remembered that in addition to ranging the battery, the Battery Commander has, from his own observation or through the medium of an observing party, himself to correct each gun separately for errors in line. While the layers are planting their posts, the Battery Commander roughly measures the angular distance of the auxiliary mark (if any), right or left of the target, by means of a scale of degrees marked on a card or on his binoculars and held at arm's length. To this is added or subtracted the deflection for drift and wind, and the result is given out as an initial order to the layers with the elevation for the first round. As soon as the battery comes into action the Section Commanders measure by means of the small clinometers the correction for level of wheels for each gun and this, as well as the Battery Commander's ordered deflection, is chalked on the top plate of the trail (see Fig. II). As each gun fires, the Battery Commander, after ordering the elevation for the *next* gun, gives the order for correcting the *last* gun for line, thus, " last gun one degree more right." This is at once marked on the trail of the gun referred to. If after " Battery fire " has begun the Battery Commander judges

that the fire from the whole battery, from one section, or from one individual gun, is too much to the right or left, he can correct it accordingly with the order "All guns (or right section or No. 3 gun) 40 minutes more right (or left)."

The deflection available on the sights as they are placed on the gun, viz.:—7 degrees right and 9 degrees left, gives a wide angle in which to select an auxiliary mark and to apply the corrections for errors of line. As the flight of the shell in the air can be followed with the binoculars even when standing at some distance to a flank, the correction of individual guns by the Battery Commander is quite possible (when he can see the target) even during "Battery fire." As a rule, however, he would probably content himself with judging the result of the fire as a whole after ranging was completed. Deflection necessary for distribution of fire is ordered by sections after the range has been found.

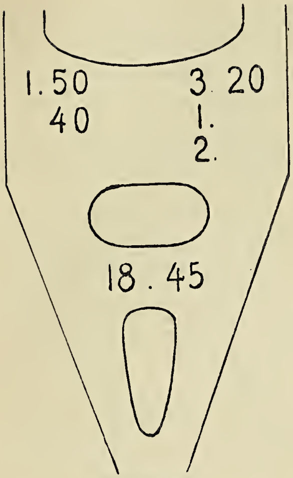

Fig. II.

In the example given (see Fig. II.) the auxiliary mark was 4 degrees to the left of the target and 40 minutes left was judged to be the deflection for drift and wind; thus "3 degrees 20 minutes right deflection" was first ordered by the Battery Commander (*i.e.*, 4 degrees right, less 40 minutes left). The Section Commander ordered 1 degree 50 minutes left for level of wheels and the subsequent corrections for line were 1 degree right and 40 minutes left, 2 degrees right being the order for distribution of fire. Each of these is chalked on the trail separately, right deflection on the right, and left deflection on the left. The resultant deflection—3 degrees, 50 minutes right—which should be on the sights, can thus be easily checked. The separate record of each correction is especially important at drill, so as to ensure that all the alterations of deflection ordered, have been complied with and also for the information of a new No. 1 or layer who may come up to replace a casualty. For the same reason it is useful to mark lower down on the trail the elevation ordered for "Battery fire." It will be noticed that the error in line of the first round fired from a gun is caused by the sum total of errors in the following, viz.:—Allowance for wind, angular distance of auxiliary mark (if any), alignment of aiming posts and level of wheels. As a rule time should not be wasted in minute corrections for line of each gun, the opening of "Battery fire" when the range has been found should on no account be delayed for this purpose.

The application of the corrections described above is not such a lengthy or elaborate matter as it would appear to be, nor does it interfere in any way with the process of ranging; the average rate of ranging of one battery at practice this year was 6 mins. 22 seconds when an observing party was employed, and 5 minutes 3 seconds when the Battery Commander observed for himself.

In the training of the layers to a free use of the deflection leaf and cross bars of the sights, they are taught to apply the deflection to the deflection leaf first, so far as it is available, *i.e.*, 3 degrees left and 1 degree right; then to make use of the cross bar of the hind sight (3 degrees), and if still more deflection is required, to apply it to the crossbar of the foresight (another 3 degrees). Care must be taken to move the foresight to the left for right deflection and to the right for left deflection.

6. *Observation.*—The effective range of any gun is limited by the power of judging the position of the burst of the shell with reference to the target. This is manifestly far easier in the case of High Explosive Common shell bursting on impact than in that of Shrapnel bursting in the air; from which it follows that howitzer batteries can and probably will be employed at longer ranges than 15-pr. batteries. Practice in observation is therefore important, more especially as in most cases the process of ranging by the Battery Commander is accompanied by the correction of each gun for line. When firing at a small target, such as a redoubt or fortified post, correction for line is of great importance, and it must be remembered that the opportunity for correcting each gun will, with good ranging, probably be limited to one round, for as has been noted before, correction of individual guns after "Battery fire" has begun, though possiblt, will not be the rule. In the case of those rounds which are fired before the long bracket is determined, observation for line is most difficult and requires careful judgment, especially if the Battery Commander is some distance to a flank. Unfortunately there is little opportunity for practising this except during actual firing on the ranges.

The best method of estimating the amount of correction to be given, is to measure the width of the target, or a definite part of it, with the degree scale already alluded to. The part thus measured can then be used as a unit in judging the error in line and the necessary correction can be ordered at once in degrees without reference to any table. To a certain extent this can be practised on the drill ground by placing men at unknown distances from a target represented by a flag. The men stand with their backs to the supposed battery and wear havresacks pulled well round to the front. When a flag is raised at the battery to represent the firing of a shot, the officer in charge of the target party orders one of the men to turn about and show his havresack. This man then represents the fall of that shell. When the officers at the battery have all judged and noted the distance short or over, right or left, the flag is lowered and the man turns about again. The process is repeated until the placed men are all finished; the officer with the target party has all the distances roughly measured and results are compared on return to barracks. This practice (which is called Observing Practice, No. 2) is carried out on different natures and slopes of ground; each days work being plotted on square ruled paper, the progress made by each officer in judging distances can thus be tested. This practice is however usually carried out on the supposition that the officers are with the observing party and not with the battery itself. The line of fire is indicated to them by signalling the magnetic bearing of the battery from the target, the fall of the shell being measured and judged with reference to the line of fire. When officers were sent out on observing duty at Okehampton this year, they found that this practice had been of considerable benefit to them.

The employment of a ranging point is a distinct help to a Battery Commander in correcting his guns for line as well as in ranging, and as the available deflection is ample to allow distribution over the widest target, the rule against the use of a ranging point (Field Artillery Drill, p.p. 94 and 105) might with advantage be modified in the case of howitzer batteries. The power of following the course of the shell in the air, which has already been alluded to, will be greater with the larger Mark II. shell, but in any case it is facilitated by the use of a ranging point. It is worth noting that as a consequence of Battery Commanders being able to follow and identify their own shells, several batteries can range at the same time on one target, which may sometimes be an advantage.

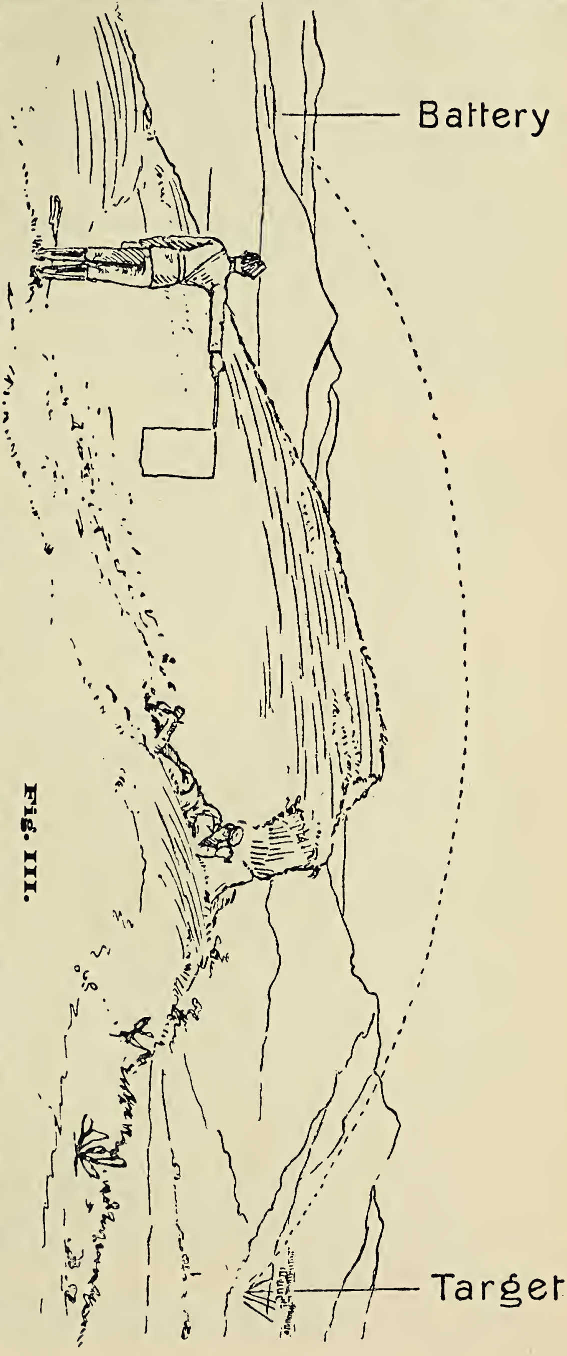

Fig. III.

Although observation by the Battery Commander is undoubtedly the surest method of ranging a battery, it becomes impossible when firing at a target which is concealed by natural features of the ground. All that can be done by the Battery Commander himself in that case, is to range on the crest of the hill covering the target and distribute for depth as laid down in the drill-book; but he would have to trust to good fortune alone for his line of fire being correct and his distribution adequate. Under certain favorable circumstances however it may be possible to place an observing party (O.P.) on some point from which the target can be seen and from which the results of its fire can be signalled to the battery (see Fig. III.).

The following system of communication between the O.P. and the battery has been found to work rapidly and effectively. After finding the range in a manner somewhat similar to that laid down in the Mekometer hand-book, the O.P. signal to the battery the distances of the target and the battery from the O.P. as well as the range of the target from the battery. If the Battery Commander does not by any means know the exact direction of his target, he can then proceed to plot on the ground, with a measuring tape and to any convenient scale, the triangle whose sides have been reported to him by the O.P. If care is taken that the side representing the distance from the battery to the O.P. is exactly in line with the O.P., the line of fire will be in prolongation of the side representing the range of the target from the battery. With well trained range takers, the error in the line of fire thus found should not exceed one degree. The drill for this is called Observing Practice, No. 3.*

Firing is then commenced and for each shot the O.P. first signal, by code, " over " or " under,"on receipt of which the Battery Commander orders the new elevation for the *next* gun. As soon as this signal is acknowledged, the O.P. signal the error " Right " or " Left," and the Battery Commander orders the correction to be made for the *last* gun fired. To enable him to do this rapidly, a special range table has been adopted by the Brigade Division. When " Battery Fire " is ordered, a signal to this effect is made at the battery, after which the O.P. signal the general result of not less than four rounds. At drill the firing of a shot is represented by the fall of a flag. In the code of signals, for " over " and " under " one flag is held upright over the head, while another is at the same time held horizontally, towards the target for " over " and away from it for " under." In signalling the line, flags held out to the right (or left) of the observer as he faces the battery, indicate that the shot has fallen to the right or left of the line drawn from the battery to the target; one flag only, means a distance of 50 yards or under, two flags mean a distance of over 50 yards. " Range " is signalled by both flags held over head, " Line " by both flags held out horizontally; "Doubtful " is indicated by holding the flags obliquely downwards. The signal for "Battery Fire " is the same as for " Range."

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* At practice this year only the range of the target from the battery was signalled; the method of marking the line of fire, here described, was not then thought of. It has only been carried out since, at drill.

As it is of great importance that all officers should be able to "range" a battery rapidly, the drill for the code of signals just described is made use of for the purpose. The elevation for each shot is signalled from the battery to the officer with the O.P. who selects a final range as the correct one. He signals his "overs" and "unders" accordingly, occasionally sending a false signal (*e.g.* "over" instead of "under") to represent a badly layed shot. To induce rapidity of decision, the time is taken from the fall of the flag (the firing of the shot) to the order given by the Battery Commander for correction for line (*i.e.* five signals—including acknowledgements—and two orders); this has been done in 10 seconds, in which time of flight is of course not included. Every elevation ordered and signal made is carefully recorded and the "ranging" is criticised afterwards. This is called Observing Practice, No. 1. At practice, when the guns are fired, the elevation for each shot is of course not signalled, as the guns tell their own tale.

7. *Rapidity of drill, etc.*—

Owing to the weight of the ammunition and the excessive recoil of the gun, especially on a reverse slope, rapid firing is only possible with full detachments and if the men have been taught to drill against time. The main cause of delay is in "running up" and much time can be saved by a detachment which has had a good deal of practice in this particular point. The following has been found to be a good plan to develope this particular muscle.

At the conclusion of ordinary "Battery Gun Drill," six wooden pegs are placed in the ground in front of each gun, five yards apart and about one yard outside the right wheel. "Section Fire" is then ordered and the guns are run up after each round, to the next peg. A race then ensues between the sections to see which will fire its six rounds in the shortest time; a drill shell is brought up from the wagon for every round and is left on the ground where the gun is fired; the layers only go through the motions of laying, the clinometers being replaced in their leather cases, as it is considered undesirable to teach the layers to hurry over their laying. With reduced detachments or on a very steep or rough reverse slope, time may be saved by running up the two guns of each section alternately with double detachments. It is found that more than two men cannot apply their weight effectively to one wheel; the best method of double-manning is therefore to use drag ropes, the right detachment manning the right ropes, while the left detachment mans the left ropes. No. 1, 2, and 4 do not run up at "double manning" unless absolutely necessary.

The work at the guns, however, is in every case so heavy that it is most desirable to employ a maximum rather than a minimum number of men from the first. The labour is thus more evenly distributed, the men will stand the strain much longer and, if the tactical conditions demand it, a greater rapidity of fire can be maintained than is possible with a smaller detachment. Superiority in an Artillery duel will be more speedily and therefore more easily and cheaply attained by throwing the whole weight into the first blows, than by keeping men in reserve for whom work can be found in the front line. This is a well recognized principle as applied to guns, and is equally true in regard to men. The contention that only a minimum number of men should be exposed to hostile fire, even if admitted in other cases, does not apply to howitzer batteries when firing from behind cover

8. *Future possibilities.*—

The influence of howitzer batteries equipped with H.E. shell on the tactics of the future, the extension of their present limited rôle on the field of battle and the degree to which they may supplement batteries equipped with Shrapnel shell, are matters which do not come within the scope of this paper, which is restricted mainly to the training necessary to meet present requirements. A few examples may however be given to show that further development of howitzer fire is possible.

The employment of indirect fire has many opponents and but few supporters, one of the objections to it being that it is useless against a target moving to a flank. It is quite possible however that a well trained howitzer battery should make good practice, with indirect fire and using aiming posts, at an infantry target moving across its front. The angle of deflection available on the sights as they stand is 16 degrees; by inverting the foresight this angle is more than doubled, while with crossed sights, *i.e.*, the right tangent sight used with the left foresight, or vice versa, an angle of 68 degrees becomes available. At a range of 2000 yards, and moving across the front at three miles an hour, infantry would remain in this arc of fire for half an hour; if moving obliquely to the front the time would be proportionately longer. During the whole of this time the Battery Commander could follow them with shells by a gradual alteration of deflection and elevation. A slight alteration of pattern in the sights would very much simplify the application of deflection for this purpose, but it is quite possible even with the present sights.

This same angle of deflection could also be made use of for distribution of fire on a broad target. The effect of the blast of H.E. shell has, it is believed, not been definitely ascertained; but assuming that it has a radius of 25 yards the fire of one battery could be distributed over a width of 300 yards without leaving any spaces between the circles of destructive effect. Infantry advancing to the attack after the artillery duel, could to this extent be covered with shell from behind cover, up to the closest ranges; the deflection for distribution being increased as the target approached.

There is no doubt a traditional feeling in favour of standing up in the open to fight it out, and if attacked by infantry which had not a superior artillery to support it, it would probably be better to send for the limbers and gallop to the top of the hill to meet the attack, provided time permitted such a course. On certain occasions indirect fire will however be the best and when such is the case, full advantage should be taken of the capabilities of the howitzer in this its strong point.

In wooded or enclosed country it may be found that the service method of placing aiming posts cannot be carried out. On the crest of the hill in front of the position in which it has been decided to place the battery, there may be only one narrow gap in the trees houses or rocks, through which the target can be seen; evidently therefore, only one pair of aiming posts, those of the gun of direction, can be aligned on the target or auxiliary mark through this opening. If however the layers link themselves together with pieces of cord 20 yards in length they can plant their aiming posts at equal distances from the posts of the gun of direction and the lines of fire of all the guns will thus be parallel. This plan can also be adopted in open country;* and if a third post be used to prolong the line of fire of the gun of direction down the reverse slope of the hill, the same advantages are gained as are claimed for the use of an auxiliary mark, viz: complete surprise of the enemy, and cover from view for the layers while placing their posts thus making it possible to conceal from the enemy for a considerable time the exact position of the battery. In this method, a ranging point deflection for each gun, according to its distance from the gun of direction, has to be ordered, if fire is at first directed on a ranging point. To ensure parallelism of the lines of fire, the layers must be dressed to a flank each time they plant their posts, front and rear, but it is not of great importance that the line of rear posts should be exactly parallel to the line of front posts. On the other hand, in the service method of planting aiming posts, the dressing of the posts is of absolutely no importance and should never be insisted on as the layers are thereby only hampered in the selection of the most favourable ground for their posts.

9. *Summary.—*

The general impression left on the mind after watching this year's practice is distinctly favorable to the future of howitzer batteries.

The experience gained has helped to remove the impression that prevails that they are lacking in mobility; the equipment is undoubtedly heavy and its weight would tell in a campaign upon the condition of the horses; but there is nothing in peace experience to show that for short advances into action they are not as mobile as 15-pr batteries. At Okehampton, one of the batteries advanced from behind "Holstock Hill" to "The corner of the wall" in 11 minutes; another advanced from the same place to "Oke Tor," including the steep ascent from "Cullever Steps" in 25½ minutes, the time being taken from the order "March" to "Action Front." In each case four gunners were mounted on each of the new limbers, which carry that number.

Those who know the ground will appreciate the degree of mobility requisite for such movements, the actual distance covered is, on such ground, no measure of the performance.

The great accuracy of the gun, the high trajectory and varying angles of descent, the perfection of the large clinometer as a laying instrument and the large angle of deflection available on the sights, combine to enable the Battery Commander to direct his fire with the greatest nicety. Especially when firing from behind cover, when every detail of laying is purely mechanical* and men's nerves are not exposed to the disturbing effects of hostile fire, a well trained battery becomes a most perfect machine in the hands of the Battery Commander, the control of which, being easier, he ought to be able to maintain longer than is possible in any other command. From his post on the hill, the Battery Commander should be able to use the fire of his battery in any way that he chooses, exactly as if he held in his hand the nozzle of a fire hose. The weight of each shell and therefore its value by the time it has reached the scene of action, makes precision of fire and therefore economy of ammunition of first importance. The responsibility of the Battery Commander in action is increased and that of the section officers somewhat decreased under these conditions; but as they may at any moment be called on to replace the Battery Commander every officer in the battery should be most carefully trained to take up at a moment's notice the duties of Battery Commander. The capabilities of the howitzer for indirect fire from behind cover are so great that when fully developed they will assert their claims to a share in the solution of the problem of how to be successful in an artillery duel with an opponent armed with Q.F. guns, without too great a sacrifice of *personnel.* The training and equipment of the batteries should therefore be such as will lead to the improvement of this class of fire. Fire discipline, or the power of control from highest to lowest, from first to last, is if possible for the reasons given above, of more importance in a howitzer Field Battery than in any other fighting body, and should be the key word of the whole of its training.

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* It was tried at Okehampton this year.

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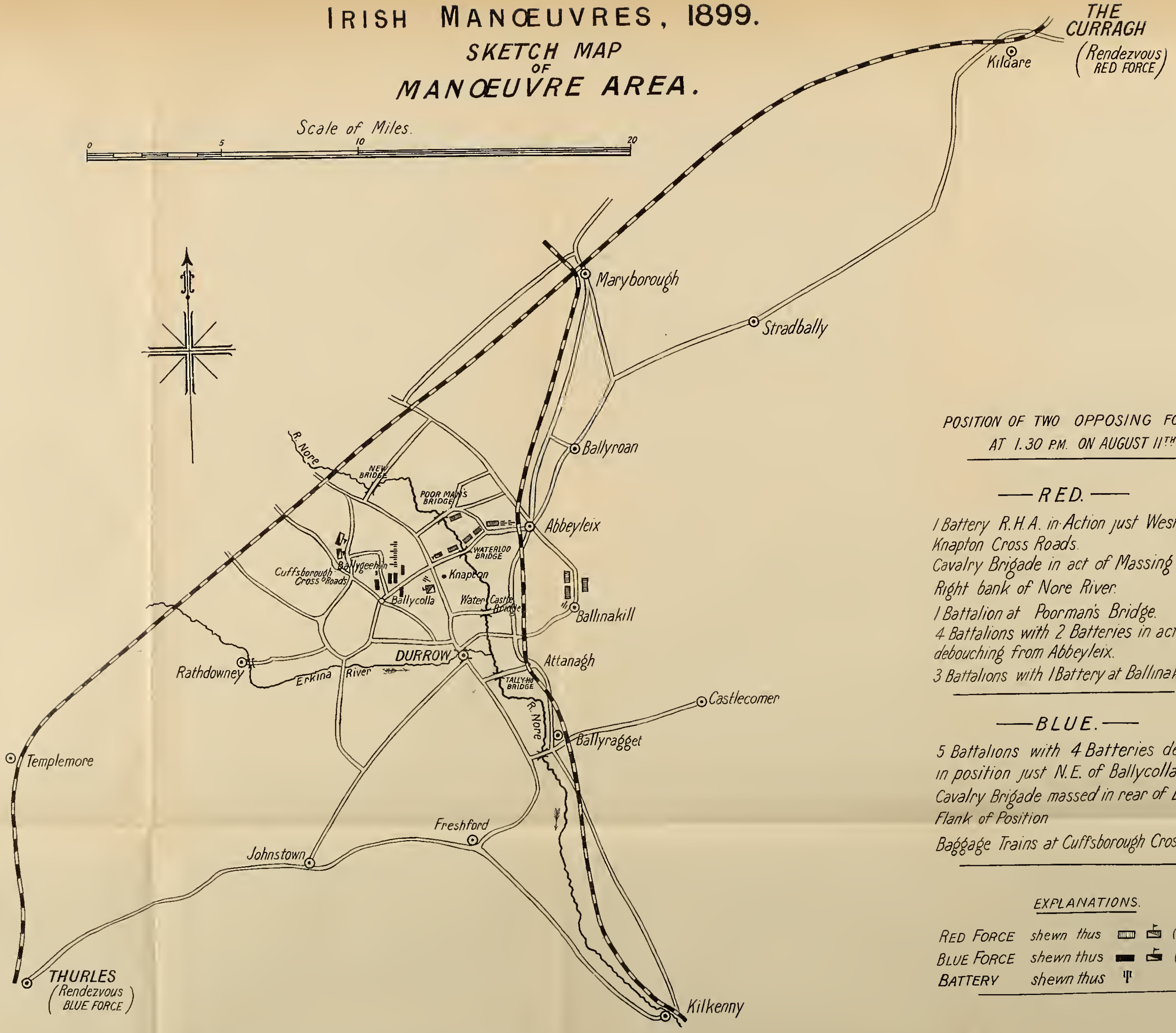
* The writer believes that for this reason indirect fire is in howitzer batteries more accurate and reliable than direct fire.

IRISH MANŒUVRES, 1899.

SKETCH MAP OF MANŒUVRE AREA.



POSITION OF TWO OPPOSING FORCES AT 1.30 P.M. ON AUGUST 11TH

— RED. —

1 Battery R.H.A. in Action just West of Knapton Cross Roads.

Cavalry Brigade in act of Massing on Right bank of Nore River.

1 Battalion at Poorman's Bridge.

4 Battalions with 2 Batteries in act of debouching from Abbeyleix.

3 Battalions with 1 Battery at Ballinakill

— BLUE. —

5 Battalions with 4 Batteries deployed in position just N.E. of Ballycolla.

Cavalry Brigade massed in rear of Left Flank of Position

Baggage Trains at Cuffsborough Cross Roads.

EXPLANATIONS.

RED FORCE	shewn thus	▥	(SHADED)
BLUE FORCE	shewn thus	▬	(BLACK)
BATTERY	shewn thus	╥	

Supplement to "Proceedings" R.A.I. Vol. XXVI, No. 10. To face page 461.

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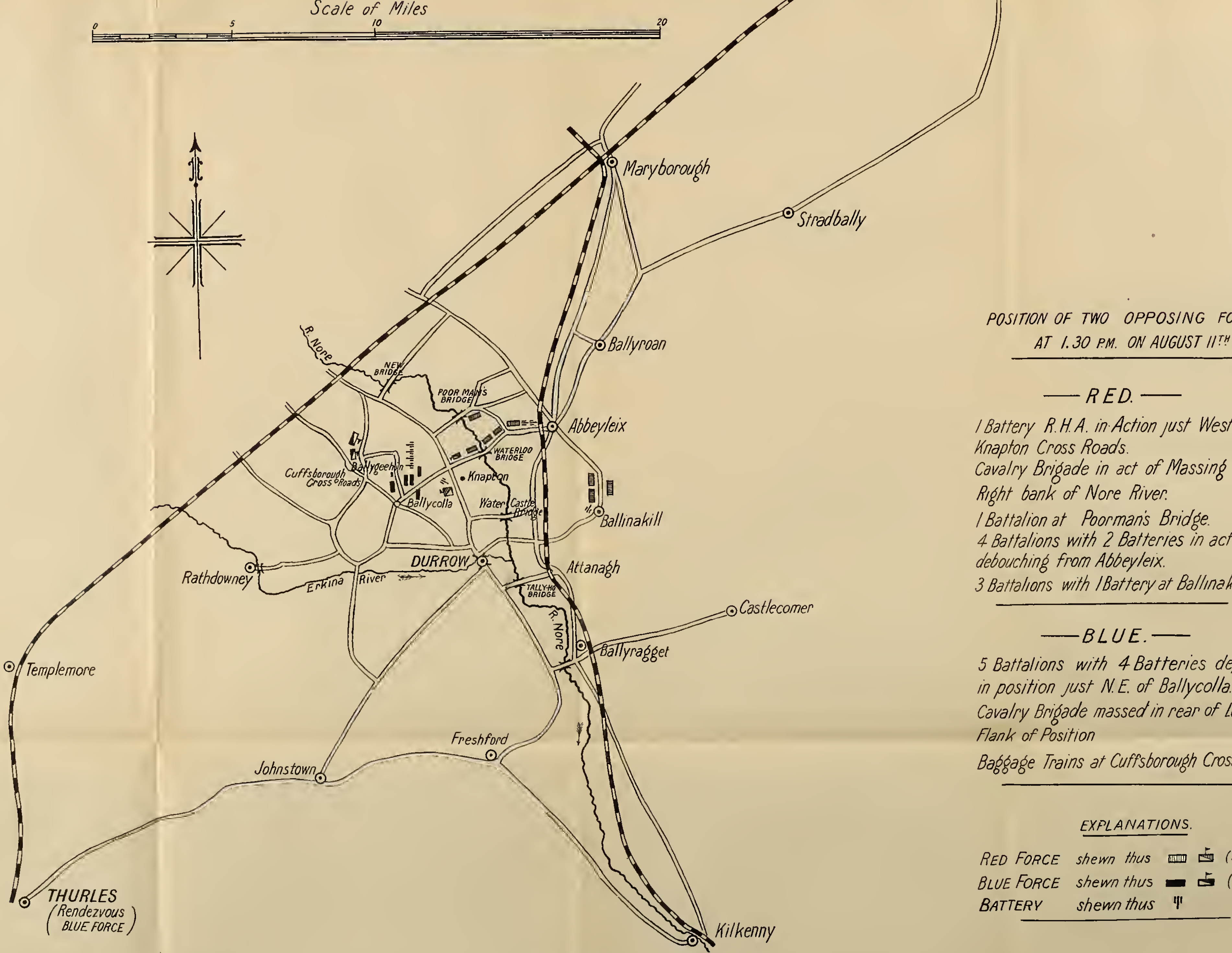

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THE IRISH MANŒUVRES, 1899.

BY

LIEUT.-COLONEL A. M. MURRAY, R.A.

THE manœuvres which took place last August in Queen's County under the directorship of Lord Roberts, were of special interest, differing as they did from the usual course of English peace manœuvres in producing some strategical situations resembling as nearly as possible such as would occur in actual war.

Although a narrative of the operations was published at the close of each day, together with the Director's remarks, these documents may not always be forthcoming, and, in any case, the Committee may care to have a short account of what occurred placed on record in the "Proceedings" of the Royal Artillery Institution.

It is not proposed to give a detailed narrative of the whole course of the manœuvres, which lasted from the 8th to the 16th August, but merely to describe their general purport, with special reference to certain strategical facts which were brought to light during the operations of the first three days before the troops came into actual tactical collision.

Two opposing forces were assembled on the 5th August—a Southern or Blue Force at Thurles, and a Northern or Red Force at the Curragh. The distance between these places is about 50 miles. Throughout this paper the forces will be called Blue and Red respectively—the names of individuals and of corps being omitted.

The strength of the Blue Force assembled at Thurles was as under:—

6 Squadrons.
4 Batteries (including 1 Battery of R.H.A.)
5 Battalions.
1 Provisional Field Company R.E.

giving a total of about 3,800 men, 16 guns, and 1,150 horses.

The strength of the Red Force asembled at the Curragh was as under:—

4 Squadrons.
4 Batteries (including 1 Battery of R.H.A.)
8 Battalions.
1 Field Company R.E.

giving a total of about 5,200 men, 16 guns, and 1,100 horses.

Both forces were provided with regimental transport sufficient to carry their camp equipment—the intention being that the troops should encamp on the ground they occupied at the termination of each day's manœuvres. As, however, food and forage were not carried regimentally, it was necessary to select beforehand certain sites which were available for camps, and stock these places with supplies. To some extent the actual manœuvring had to be regulated by the above considerations, but otherwise the operations were carried out under active service conditions.

The general and special ideas were as follows:—

General Idea.

A main Blue Army (imaginary) has landed in GALWAY BAY, and is marching on DUBLIN, where a Red Army (imaginary) has concentrated to oppose it.

The fall of CORK, which has been beseiged, has set free a second Blue Force to join the Main Blue Army.

A force is detached from the Red Army to prevent the junction of any Blue troops from CORK with their main Army, and, if possible, to destroy them and rejoin at DUBLIN.

N.B.—(1). Railways are not available for use by either force; (2). Telegraphs as they exist, are available for both forces; (3). Without bridging material or boats, the River Nore is impassable, except at the recognized points of passage.

Special Idea (Red).

On August 8th, the Red Force detached towards CORK, reaches KILDARE, and information is received that a Blue Force (a brigade of cavalry and a brigade of infantry with artillery) has reached THURLES marching in a north-easterly direction.

Special Idea (Blue).

The BlueForce from CORK is ordered to march, via THURLES-JOHNSTOWN - DURROW - STRADBALLY, to join the Blue Army near KILDARE. On August 8th it reaches THURLES.

A glance at the sketch accompanying this paper will show the difficulty of the task entrusted to the Blue Commander. Interposed between his force and, blocking his juncture with the main Blue Army, was a Red Force of superior strength. Two alternatives were open to him. He could either await the enemy's attack in a chosen position and hope to fight a successful battle, but with no strategical advantage in his favour; or he could attempt a flank march past his opponents' right, with the certainty, if attacked, of being compelled to form line to a flank and fight at great strategical disadvantage. He had one initial advantge, viz., a superiority in cavalry: 6 squadrons against 4.

The Red Commander's task was easier. Marching south-west, his clear course was to keep his force concentrated, find out his enemy as quickly as possible, force him to deploy on a line parallel to his line of advance, and, after defeating him, drive him off the THURLES-KIL-

DARE roads, away from his communications with CORK or with the Army advancing from Galway Bay.

The following is a brief narrative of what took place:—

8th August.—The Blue Cavalry Brigade marched to Johnstown, and the Red Cavalry Brigade to Stradbally.

These movements were ordered by the Director to take place under peace conditions. No advance beyond these positions was allowed till 10 a.m. on the 9th August, when the conditions were to be those of active service.

9th August. *Blue Force.*—Cavalry Brigade reached Durrow at 2 p.m. On the left of its advance no attempt was made to reconnoitre beyond the Erkina river, which was reported clear of the enemy soon after mid-day. On the right flank the line of the Nore was secured from Durrow down to Ballyragget—posts being established there and at Attanagh.

Main body with G.O.C. marched to Johnstown.

Red Force.—Cavalry Brigade reached Ballyroan at 1.15 p.m. On the right officers patrols were pushed forward to Poorman's and Waterloo Bridges over the Nore and to Durrow: and on the left to Ballinakill and towards Ballyragget. In the course of the afternoon Poorman's and Waterloo Bridges were reported unoccupied, and it was ascertained that the main body of the Blue Cavalry was at Durrow—Ballyragget being held by a small post. Red Cavalry posts were established at Abbeyleix and Ballinakill for the night.

Main body with G.O.C. marched to Stradbally.

The remarks of the Director on this day's operations were as under:

"The Blue Force Commander was naturally solicitous for the safety of his left flank, and in his anxiety to keep all clear in that direction he gave instructions to his cavalry commander, which the latter accepted in somewhat too literal a sense, and tied himself down to the line of the Erkina river. The work of his cavalry on this river line was well performed, but at the close of the day's operations he knew nothing of the position of the Red Cavalry, and, beyond the information of the attempt of a Red patrol upon his outposts at Watercastle Bridge, he saw or heard nothing of his opponent.

"The Red Cavalry Commander's instructions left him free to act as he deemed best, and he pushed forward his patrols with enterprise. Those on his left did particularly well, those on his right, with the exception of the one to Durrow, which passed through the enemy's outposts at Watercastle Bridge, were less vigorous; and contented themselves with reporting Poorman's and Waterloo Bridges unoccupied, making no attempt to gain further information of the enemy. On the whole, however, the Red Commander was well served by his patrols and learned the position of the enemy's cavalry."

10th August. *Blue Force.*—The Cavalry Brigadier established his headquarters at the Cross roads, half a mile west of Knapton House, and secured all the passages of the Nore from Poorman's Bridge to Durrow.

Main body with G.O.C. reached Durrow.

Red Force. Detaching two squadrons to Ballinakill and a third squadron to attempt to capture Poor Man's and Waterloo Bridges, the Cavalry Brigadier halted at Abbeyleix with the remaining squadron and battery of Royal Horse Artillery. Poor Man's and Waterloo bridges remained in possession of the Blue Cavalry.

Main body with G.O.C. advanced to Ballyroan.

During this day the Blue Commander's superior strength in cavalry began to make itself felt. By securing the passages over the Nore he prevented the Red Cavalry from getting access to information, and effectually screened his future movements. The Red Commander was already "enveloped in the fog of war."

The Director's remarks were as follows:—

"The Blue Commander was better served by his advanced squadrons and patrols than was his opponent.

The Red Commander was unnecessarily anxious about his left flank. Had he concentrated the whole of his force early in the day at Abbeyleix he would have been in a better position to oppose any attempt of the Blue to out-flank his right. Being the weaker by two squadrons, concentration was all the more important."

11th August. *Blue Force.*—The Cavalry Brigade maintained its positions on the Nore, blocking all the passages till noon.

Under cover of this screen the artillery and infantry marched to Ballycolla, and deployed soon after mid-day on a position facing east, as shewn in the sketch map attached.

The baggage trains reached Cuffsborough cross roads at noon.

After destroying the bridges the Cavalry Brigade withdrew slowly from the Nore, and took up a position in rear of the left flank of the Blue Force position.

Red Force. Detaching two battalions to Ballinakill, the Red Commander halted at Abbeyleix with six battalions, three batteries and the field company Royal Engineers, waiting there for information. Always apprehensive for his left flank, and misled by incorrect rumours from his cavalry, he subsequently detached a battery, and a third battalion to Ballinakill. A fourth battalion was at the same time sent to Poor Man's Bridge which was found destroyed. At 11.40 a.m., the Director decided to allow the passage of Waterloo Bridge to the Red Force, when the Red Cavalry with the Royal Horse Artillery battery passed over, coming at once under the fire of the Blue Commander's four batteries which were deployed for action on the left flank of the Blue Force Position.

At 1.30 p.m. the Director ordered the "cease fire," the final positions of both forces being as shewn in the sketch.

An examination of the respective positions of both forces shows that the Blue Commander had accomplished his object, and a decision to this effect was given by Lord Roberts. With a superior force of cavalry, artillery, and infantry he held a strong central position dominating the road from the Nore over Waterloo Bridge. His baggage trains were well on the way to Maryborough. His communications with the Galway Bay Army were open. Under cover of a strong rear guard he could have marched the whole of his concentrated force away from his opponent's divided forces with the certainty of reaching his objective.

The Director's Comments were as follows:—

"The Blue Commander's orders were clear and concise, and the position which he had decided to ocupy near Ballygeehin was strategically correct. It was the right line for him to adopt with a view to affecting a junction with his main Army when he found the principal road through Abbeyleix blocked. He took a sound strategical view of the situation, and gave himself the best chance of carrying out his orders and joining the Blue Army. He showed considerable skill in the execution of his flank march, and in the selection of his position which he occupied. From this position the Blue Commander could not have been turned out by the force at the disposal of the Red Commander before the latter had recalled his detached troops from Ballinakill.

"The Director is of opinion that the Red Commander hardly appreciated that Blue's left was his strategic flank, and that his endeavours should be to get to "windward" so to speak, of that flank. Either the Blue Cavalry was extremely active in preventing the discovery of the main body's position, or there was want of enterprise and method in the scouting of the Red Cavalry, but the fact remains that the Red Commander was ill served by his Cavalry Brigade, and it was not until informed by the Director that his left flank was secure, that he made any advance westwards."

The strategical situation developed in the operations described above suggests much food for thought. Although the Blue Commander succeeded in his endeavour its hazardous nature is indisputable. Had the Red Commander been correctly informed of his opponent's whereabouts, and the whole of the Red Force concentrated at Abbeyleix, he could have fallen on the Blue Force before it had completed its development, (as Radetzky fell on the Sardinians at Mortara, and as the Germans fell on Bazaine's Army at Vionville*) catching it *flagrante delicto*, attacking it with superior force, and driving it away from its line of communication.

Many lessons were taught by these three day's manœuvres—chief among them being the necessity for pushing home the cavalry reconnaissance. Correct information is essential for a commander before forming his plans. Surmise cannot be relied upon as a basis for action. The wish is oftentimes father to the thought. Napoleon made three surmises on the eve of the battle of Jena, and they were all wrong.† The Red Commander's surmise that the Blue attack would be made on his left flank led him to make false tactical combinations, and at the decisive moment, left him in the hollow of his enemy's hand. It requires an effort of patience to wait for the cavalry reports, but the effort is always necessary and always rewarded. "Reconnaissance," wrote Lord Roberts in a memorandum drawn up before the manœuvres began, "is perhaps the most important of all the many important duties that devolve on a Commander. Whether the force consists of an Army Corps, a Division, or only a Brigade, no preparation for battle can be satisfactorily made until information of the strength, whereabouts, and, as far as possible, the plans of the enemy have been ascertained."

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*And as Wellington did on Marmont at Salamanca though in this case owing to the English Commander not following up his victory with a pursuit the French regained their base at Valladolid.

† Campaign of Jena, October, 1806. On the 10th he thought Prince Hohenlohe was about to attack him; on the same date he erroneously believed the Prussians were concentrating at Gera, and on the 13th he thought he was opposed by the whole Prussian Army instead of by only the portion under Hohenlohe. The result of this last surmise was that he massed at Jena a force double that of his enemy, while he left Davout with only 27,000 men to fight the Duke of Brunswick with 51,000. Davout was victorious but this was not owing to Napoleon's superior strategy.

The truth of the above words was practically illustrated by the result of the manœuvres which furnished an object lesson never to be forgotten by those who took part in them.

SYNOPTICAL CHARTS

APPLIED TO MILITARY SUBJECTS.

BY

CAPTAIN B. R. WARD, R.E.

Instructor in Fortification and Geometrical Drawing
at the
Royal Military Academy, Woolwich.

A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday, 27th October, 1898.

COLONEL R. CORBETT, R.A. IN THE CHAIR.

THE CHAIRMAN:—Ladies and gentlemen, I do not think it is necessary to introduce Captain Ward to you; he is very well known here. I will, therefore, simply ask him to commence his lecture.

Captain WARD:—As the subject of Comparative Synoptical Charts is probably new to many of you, it may, perhaps, be as well to commence with a few words of definition and explanation.

The charts published by the Comparative Synoptical Chart Company, of 5, Copthall Buildings, E.C., are called synoptical in that they present in each case a synopsis or bird's eye view of the subject delineated, and they are called comparative in that they enable the comparative significance of contemporaneous events to be appreciated.

Now the root idea on which the work of this company is based is that the eye can apprehend in a minute more than the ear can receive in an hour. This is a very old and well-established principle.

In the teaching of geography it is consistently acted upon. Maps and charts enable us to realise in five minutes what hours of verbal description would never convey.

In the study of history, graphic methods have, however, (speaking generally,) been up to the present conspicuous by their absence.

Now from the point of view of the student of history, military or otherwise, this is nothing less than a monumental blunder, not to say a crime. Consider for a moment what the sense of sight can do as compared with the other senses. A landscape with its clearly detailed foreground, its less defined middle distance, and its hazy distance, presents no difficulties to the sense of sight. We can take it all in as we say at a glance.

How slow and tentative are the methods by which the sense of touch, the sense of hearing, the sense of smell, and the sense of taste convey information to the brain.

The sense of sight works with a completeness and rapidity which differentiate it absolutely from the other senses.

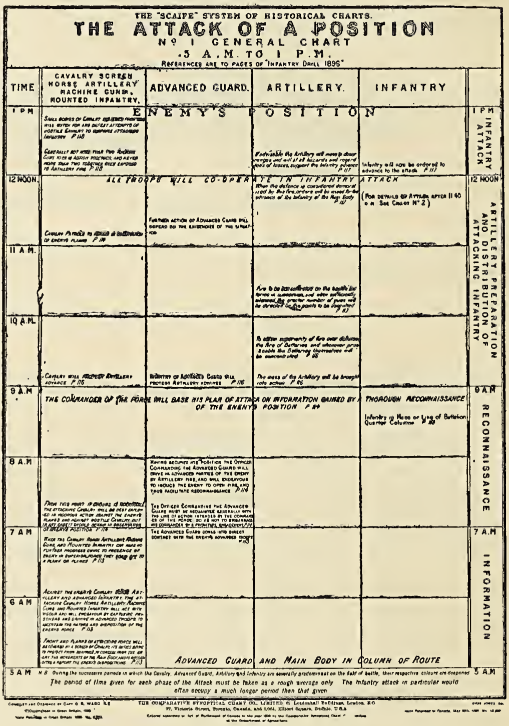
Can we in any way make use of this peculiarity of the sense of sight, by giving it an opportunity of providing us with "sense-impressions" which will be of service to us in our military studies? To some extent I think we can.

THE ATTACK OF A POSITION.*

The chart entitled "The Attack of a position," (Fig. 1.) illustrates graphically the maxims of Part V. of the Infantry Drill Book and may help to explain what I mean. The chart is one of a military series published by the Comparative Synoptical Chart Company, and as it is designed on exactly the same lines as all their other charts, when you have once grasped the principle of this one you will have no difficulty in understanding any other chart.

Lapse of time is thus visualized and drawn to scale, and must be looked upon more in its analogy to the growth of a tree than to the flow of a river.

In addition to the vertical time-scale, a series of headings, arranged horizontally along the top of the paper, divide the chart up into columns of various subjects.


THE "SCAIFE" SYSTEM OF HISTORICAL CHARTS.
THE ATTACK OF A POSITION
No. I GENERAL CHART
5 A.M. TO 1 P.M.
References are to pages of "Infantry Drill 1896"

TIME
CAVALRY SCREEN HORSE ARTILLERY MACHINE GUNS, MOUNTED INFANTRY.
ADVANCED GUARD.
ARTILLERY.
INFANTRY
1 PM
12 NOON
11 A.M.
10 A.M.
9 A.M
8 A.M
7 A.M
6 A.M
5 A.M
ENEMY'S POSITION
ALL TROOPS WILL CO-OPERATE IN INFANTRY ATTACK
THE COMMANDER OF THE FORCE WILL BASE HIS PLAN OF ATTACK ON INFORMATION GAINED BY A THOROUGH RECONNAISSANCE OF THE ENEMY'S POSITION
ADVANCED GUARD AND MAIN BODY IN COLUMN OF ROUTE
INFANTRY ATTACK
ARTILLERY PREPARATION AND DISTRIBUTION OF ATTACKING INFANTRY
RECONNAISSANCE
INFORMATION

Infantry will now be ordered to advance to the attack P 117

(For details of Attack after 11 40 a m See Chart No 2)

N.B. During the successive periods in which the Cavalry, Advanced Guard, Artillery and Infantry are severally predominant on the field of battle, their respective colours are deepened

The period of time given for each phase of the Attack must be taken as a rough average only. The infantry attack in particular would often occupy a much longer period than that given

THE COMPARATIVE SYNOPTICAL CHART CO., LIMITED

Fig. 1.

The use of this vertical time-scale in combination with horizontal subject-headings is protected by patent.

Now in the chart before us—considering at first the left hand portion only—the vertical time-scale is marked in hours, comencing at 5 a.m. at the bottom of the chart, and ending at 1 p.m. at the top.

The subject-headings, commencing from the left are: Cavalry Screen, Advanced Guard, Artillery, Infantry.

All references in Part V. of the Drill-Book to the Cavalry Screen in relation to the attack of a position are entered in the left-hand column; all references to the action of the Advanced Guard occur in the second column from the left; all references to the rôle played by Artillery are entered in the third column; and the fourth or right-hand column is devoted to the doings of the main body of the Infantry.

As the Cavalry Screen, Advanced Guard, Artillery, and Infantry respectively become predominant on the field of battle their colours on the chart are deepened; but as all arms co-operate right through from start to finish, their colours are shown throughout the whole period, but of a lighter shade than during the period of predominance. From 5 to 7 a.m., *information* is being gathered by the Cavalry screen; from 7 to 9 the Advanced Guard is making a *reconnaissance*; from 9 to 12 occurs the *Artillery preparation and distribution of attacking infantry*; and finally from 12 to 1 occurs the *infantry attack*.

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* It is regretted that no block could be procured to permit of this chart being reproduced in the "Proceedings" R.A.I. to a larger scale.—Secretary, R.A.I.

Now Part V. of the Infantry Drill Book deals necessarily much more fully with the Infantry Attack than with any of the previous phases of the action.

The action of the artillery for instance is dismissed in one page, whereas some 15 pages are devoted to the details of the infantry attack. The tendency also at field manœuvres is to cut short the period of artillery preparation. The false impression, which is thus sometimes produced is counteracted in this chart by the long line of dark blue from 9 to 12, which may thus tend to prevent our future generals from committing the error of Lord Gough at Chillianwallah, which error might have been repeated at Goojerat had his staff not taken the precaution of locking the door leading down from the flat roof where he was stationed, until the artillery had had full time to take effect. The right hand side of the chart is devoted to the infantry attack alone, and represents on an enlarged scale the last hour of the action.

At 12 noon the infantry are assumed to be 3000 yards from the enemy's position, which is taken by assault at 1 p.m. The pace may seem perhaps to be a little rapid—possibly it is somewhat too rapid for a successful attack—as a matter of fact, it is just about the same speed that was kept up by the 38th German Brigade atl Mars-la-Tour in 1870, during their advance over a fire-swept zone 2000 yards in depth.

The various zones of 'fire through which the attacking infantry successively pass are indicated by gradually deepening shades of brown.

The nature of fire to be anticipated in each of these zones—artillery fire, long-range rifle fire, collective rifle-fire, and lastly a combination of collective and individual rifle-fire—are also given, as well as the technical names of the various ranges—distant, long, medium, and decisive. At intervals up the chart are inserted quotations from the drill-book indicating such matters as the proportionate strength of the various lines, the average distances to be kept, the width of the front of attack for a given force, whether the advance should be made with or without firing, and so on—in short such extracts as an officer of the attacking force might wish to be reminded of during each successive stage of the advance. A chart of this kind, hung up in a position where it can be seen and readily refered to, should, I think, do much to impress the doctrines of Part V. of the drill-book upon the mind.

References are made throughout on the face of the chart to the pages of the 1896 edition of the Infantry Drill, so that the study of the chart and of the drill-book can be carried on simultaneously, the coloured diagram assisting the memory by deepening with the assistance of the eye, the impresion on the mind produced by the study of the printed page.

No other tactical chart has as yet been published by the Synoptical Chart Company, but it is in the realm of history that their system particularly applies.

THE AMERICAN CIVIL WAR 1860-65.*

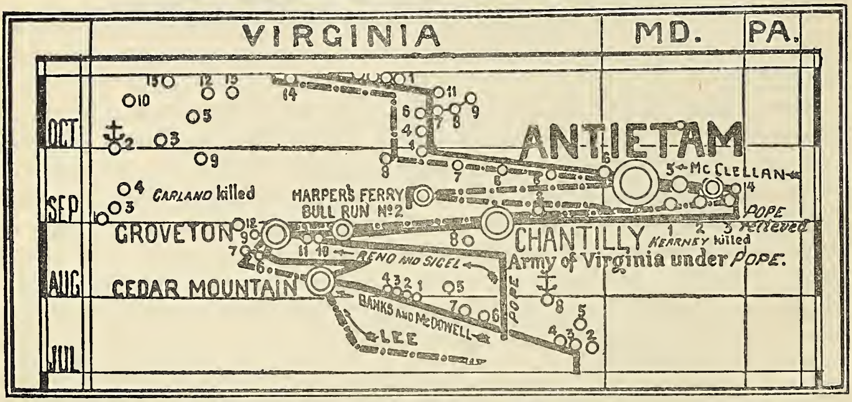

Fig. 2. Section of Chart.

The first of their charts which I ever saw was the one illustrative of the American Civil War; and it was my conviction of the entire admirableness of the method exhibited in this chart, as well as an equally strong conviction of the educational power wilfully discarded in this country, by our hesitating use of graphic methods, that induced me to work at the tactical chart you have just seen, and also at a graphic representation of a combined history of fortification and artillery, which I hope to show you presently.

I remember, some seventeen or eighteen years ago, attending a meeting of the British Association at Southampton, to hear an address delivered by Sir William Thompson—now Lord Kelvin—on the subject of the tides. On the platform was a large and decidedly complicated piece of machinery, some five feet in height. It consisted chiefly of a large number of cog-wheels, which actuated a series of automatic recorders.

In introducing the lecturer, the President said that by means of this machine, Sir William Thompson was able to predict the state of the tide at any port in the United Kingdom at any time of the day or night for the next 100 years.

That sounded a large order, but those who have ever heard Lord Kelvin lecture will not be surprised to hear that before he sat down he had impressed the entire audience with a sense of the scientific nature and reality of the predictions of his machine. I have not quite such a sweeping assertion to make with reference to this chart, but I will say this, that with this chart before you, you will be able in five minutes to fix the location of any large body of men—Federal or Confederate—together with the name of their leader, on any day, in any state of the Union or the Confederacy, between the secession of South Carolina in 1860 and the fall of Richmond in 1865.

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* Owing to the original chart used at the Lecture being too great to reproduce, a section of it dealing with the operations in Virginia in 1832 is published as a specimen, for which our thanks are due to the Comparative Synoptical Chart Company, 5, Copthall Buildings, E.C.—Secretary R.A.I.

The chart will do a great deal more than this, but let that suffice for the present. The following is a description of it:—

Vertical Divisions. The chart is divided by vertical lines into twenty-one columns of varied size. The two outer ones on either side show the fluctuations in value of the dollar of the Union and Confederation respectively, and the proportion of men to one million which either side had in the field at any time. The States in which fighting actually took place are represented by the remaining seventeen columns, which are graded in accordance with the importance of the operations taking place within their borders.

Horizontal Divisions. The chart is further divided by horizontal lines which mark it off into the months from December 1860 to May 1865, thus enabling the student to locate any event in the war with the greatest accuracy.

Circles and Dots. Engagements are shown by a system of circles and dots the sizes of which are determined by the importance of the battle of skirmish. For instance, Gettysburg is shown by a circle of the first magnitude, Chancellorsville by one of the second, and so on, in a descending scale to the numbered blue or red dot denoting a minor engagement, naval or military respectively. These dots, when connected with the line showing army movements, represent smaller battles fought by the main army. Isolated dots show fighting between detached bodies of troops, or local levies.

Army Movements. The movements of the Union armies are shown by means of a thick, solid, black line, accentuated with yellow. The Southern movements are similarly portrayed by a broken line enforced by green. The co-operation of the Union Navy with the land force is shown by means of a cable and anchor. Advance is shown by the progression of the line away from its own base, and a retreat by a return toward it. The base line of the Federal army is presumed to be Washington, and the Confederate rallying points are Richmond in the east and Vicksburg in the west.

The Map. The map shown at the bottom of the chart, where also various explanatory keys and other information will be noticed, is a re-production of a war-time publication. The boundaries of States, and the railways are those in existence at that time. Railways shown by red line.

The columns representing States of the Union are coloured blue, those representing Confederate States grey. The date of secession of each State is thus clearly and graphically indicated.

As an index of facts relating to the Civil War, this chart appears to me to be admirable.

Doubtless, a knowledge of the history of the Civil War cannot be gained from the chart alone, but to a student of any particular campaign in that war, the chart would be of the greatest use, not only as an index of facts, but as a presentment of operations that led up to that particular campaign and of other operations going on simultaneously in other theatres of the war. What a valuable adjunct to Napier for instance, would be a chart of the Peninsular War worked out on these lines! The war of 1870-71 would also, I should think, lend itself to similar treatment with good effect.

The Synoptical Chart Company publish note-books specially designed for recording information intended for embodiment in a chart, so that every facility is afforded to anyone who should feel moved to take up the subject of chart-making.

The time is, I would venture to predict, not so very far distant, when a military student would as soon think of studying a campaign without a synoptical chart, as without a map of the country.*

SIX CENTURIES OF ATTACK AND DEFENCE.†

The chart entitled "Six centuries of attack and defence," (Fig. 3) was got out primarily for the use of cadets and is intended to elucidate the chapters on historical fortification in the text-book used at the Royal Military Academy. It may, however, I think be found to be of use to officers generally as an index of facts in the history of warfare.

At the close of the first book of the Dunciad, Pope describes the Goddess of Dulness in the act of initiating the hero of the poem into her mysteries. How to attain to literary success without trouble and without genius is the burden of her discourse.

Amongst other glowing promises she describes

> "How index-learning turns no student pale,
> Yet holds the eel of science by the tail."

I am not prepared to vouch for the accuracy of the first part of her statement, but in the latter part there is, I think, a good deal of truth.

Such monuments of "index-learning" as "Dr. Johnson's Dictionary," the "Encyclopædia Britannica" and the "Dictionary of National Biography" are sufficient evidence that since Pope's time the value of "index-learning" has obtained more and more recognition.

The eel of science once grasped by the tail by means of an alphabetical index, is not likely to make good his escape from any future generation of men. The accompanying chart forms in a small way an index of the main facts in the history of the art of war during the last six centuries.

Although not alphabetical, the facts are easily referred to owing to the small number of headings; so that I think it is fair to entitle it an index.

It has besides, this advantage over a printed index that the facts are represented graphically as well as given in words. The chart may be described shortly as an attempt to present at one view, and as far as possible graphically, the gradual progress of the art of war since the invention of gun-powder.

On each side of the chart is a vertical time-scale, which reads upwards from the middle of the thirteenth century. The vertical time-scale is cut by horizontal lines, spaced at equal distances representing twenty years.

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* *The Times* is at the present moment bringing out a synoptical chart of the military operations in Natal.

† We are indebted to the R.E. Institute for placing at our disposal the block which enabled us to re-produce this chart in the form of the attached supplement.—Secretary R.A.I.

The left-hand side of the chart is devoted to the evolution of fortification, the right-hand side to the evolution of artillery and small arms, and the interval between them to a list of the British monarchs, and to matters affecting military history generally; *i.e.*, the principal wars that have taken place during the last 600 years, a list of eminent scientists, artillerymen, and engineers, and a statement of the tactical predominance of various arms on the field of battle.

This latter column is, perhaps, more open to argument than any other, so that it will be as well to give authorities as far as possible for the statements made therein.

The rise of the feudal system, involving the predominance of the mail-clad horseman began as far back as the days of Charles Martel in the eighth century ("Encyclopædia Britannica," 9th edition, Art. "Army," by Sir George Colley, Vol. 2, page 563).

In Sir George Colley's words: "The fall of feudalism as a military system, though gradual, as all such changes are, may be said to have been accomplished in the middle of the fifteenth century. Two events occurring about that time gave it its death-blow—the defeat of the Burgundian chivalry by Swiss infantry in the three successive battles of Granson, Morat, and Nancy; and the establishment of "compagnies d'ordonnance" by Charles VII. of France. The first destroyed for ever the overwhelming prestige attached to the mailed horsemen, and restored infantry to the place which it had held in ancient armies, and has never lost since; from the second dates the origin of 'standing armies' in Europe." Although the fall of feudalism may be said not to have been definitely accomplished till the middle of the fifteenth century, yet there can be no doubt that the English archers under Edward III. and the Black Prince at the commencement of the Hundred Years' War with France uttered with no uncertain voice the doom of chivalry and the mail-clad horseman.

"The fall of France," says Green in his "Short History of the English People," speaking of the Battle of Crécy, was hardly so sudden or so incomprehensible as the ruin at a single blow of a system of warfare, and of the political and social fabric which rested on it. Feudalism depended on the superiority of the mounted noble to the unmounted churl; its fighting power lay in its knighthood. But the English yeomen and small free-holders who bore the bow in the national "fyrd" had raised their weapon into a terrible engine of war; in the English archers Edward carried a new class of soldiers to the fields of France. The churl had struck down the noble; the yeoman proved more than a match in sheer hard fighting for the knight. From the day of Crécy feudalism tottered slowly but surely to its grave."

The year 1346 is, therefore given on the chart as the date on which the mail-clad horseman resigned his pride of place to the archer, who in his turn, was destined to reign on the field of battle for 250 years.

Nor need this long period of predominance excite our astonishment. The ordinary range of the bow, on the authority of Neade, a celebrated archer of Charles I., was from 16 to 20 score yards (say 300 to 400 yards), and so rapid was the shooting of the archers, or so slow the firing of the musketeers of the period that an archer could shoot six arrows in the time occupied in loading and discharging one musket. ("Encyclopædia Britannica," Art. "Archery," Vol. 2, p. 373). A reference to Colonel Hime's "Stray Military Papers," p. 44, reminds us of the fact that "The Rifle Corps" raised in 1800, and now known as "The Rifle Brigade," was armed during the Peninsular War with a weapon which was sighted to 100 yards, with a folding sight for 200 yards.

The extreme range of the Peninsular rifle was, therefore, well within the 16 score or 320 yards, which was for over 200 yards the minimum range at which archery practice was carried out. In view of this fact, the wonder rather is that the musket superseded the bow so soon.

The fact is, however, capable of easy explanation. Colonel Hime thus puts the case for the musket in his " Stray Military Papers," page 14. " The arrow glanced harmlessly off armour which was unable to resist ' the furie of the fire-shot.' " The musket, too, was better adapted for general use, in as much as " the weakest (might) use guns as well as the strongest," whereas " your lusty and strong yeomen were chosen for the bow." Further, " the bow (required) more practice to skilful use than any other instrument of offense."

The fire-arm, in fact, though it by no means put the awkward upon a level with the skilful, put him more nearly so than he ever was before.

Even so late as the reign of Charles I., the Earl of Essex raised a company of archers for the service of the King, but the predominance of the archer was by that time a thing of the past. The fact that in London in 1590, a work was published by Sir John Smythe, entitled " Certain Discourses concerning divers sorts of weapons "—the said work constituting an attack on fire-arms ; and that a pamphlet by H. Barwick, entitled " Brief Discourse concerning weapons of fire," constituting a defence of fire-arms, in reply to Smythe, was published in London, in 1594, prove that even in England, the home of the archer, the bow was at the close of the sixteenth century giving place to the weapons of the musketeer and his assistant, the pikeman.

The supremacy of the musketeer and pikeman was challenged by Gustavus Adolphus in the Thirty Years' War, and " so successful was he in the employment of his cuirassiers and dragoons—into which two divisions his horsemen were classed—that all other European nations began to imitate him, and adopted his formation in three ranks."—(Encyclopaedia Britannica, Art. Cav., Vol. 5, p. 262.)

Oliver Cromwell has lately been re-discovered for us in England as a great cavalry leader by Captain Hoenig. He successfully demonstrates that the great Englishman was the real originator of the " shock tactics " of cavalry, that in his use of cavalry he anticipated Napoleon and Blucher in the pursuit, and that he was the precursor of Von Moltke in his employment of the cavalry screen.

Probably in this matter Cromwell was a student of the tactics of Gustavus. " We have no actual record," writes General Maurice in his essay on " Military Literature," of Cromwell's studies of any kind during the years which preceeded the Civil War. Knowing, as he did, for some years before the war began, that it was clearly coming, he may have . . . cautiously avoided all study of the previous experiences of others. During those years before the meeting of the Long Parliament, which Cromwell spent quietly on his farm, all Europe was ringing with the exploits of one of the most brilliant of all leaders of war Some of the best accounts of his mode of fighting, and of his battles which we even now possess, had been published in England. Five hundred Englishmen, almost all of them naturally of Cromwell's religious party, many of them Cromwell's acquaintances at least, had served in the armies of the great "Lion of the North."

It may have been the case, of course, that just at the moment when everything was looking in England as if only the sword would decide the issue, Cromwell carefully abstained from interesting himself in the story of those wars of Gustavus Adolphus, of Wallenstein, and of Tilly, with which everyone else was absorbed.

Neither his letters, nor his speeches, nor his conduct of battles look to me as if that were true. I find him at the very first entrance into the war acting on principles which past experience had established, following closely upon just that stage which the art of war had reached under Gustavus. It is certainly more than likely that Cromwell's ideas on the employment of cavalry were derived from a study of the tactics of Gustavus."

Anyhow, Cromwell's use of cavalry was by far the most striking military feature of the Civil War.

It is in recognition of the supreme position attained by Cromwell's "Ironsides" and Light Cavalry, that a band of colour showing the predominance of cavalry extends over the latter half of the seventeenth century. The supremacy of cavalry was not, however, destined to last long. In Colonel Hime's words: "The introduction of the bayonet marks the end of mediæval and the beginning of modern war. Possessing the defensive properties of the pike, it drove this weapon from the field; turned the pike-men into musketeers; increased the volume of fire; and gave rise to new formations of which those now in use are only developments. Tactics were revolutionised by a dagger some twelve inches long, attached to the muzzle of the musket."—(" Stray Military Papers," page 23).

Before the pike was definitely driven from the field by the socket bayonet, which doubled the volume of infantry fire by dispensing with the use of pikemen,—each musketeer being now provided with a serviceable weapon against cavalry at close quarters, in the shape of his fixed bayonet—several solutions of the problem of infantry efficiency had been proposed. Of these the most promising had been the dagger or plug bayonet. The obvious disadvantages of this weapon soon however made themselves felt.

"The defeat of the Royal troops at Killiecrankie in 1689 was undoubtedly to some extent due to the defects of a bayonet which screwed into the muzzle of the musket. 'The Highlanders are of such quick motion' says the defeated General 'that if a battalion keep up his fire till they be near to make sure of them, they are upon it before our men can come to the second defence, which is the bayonet in the musle of the musket.'"

In consequence of this, General Mackay "invented the way to fasten the bayonet to the musle without, by two rings."—(Hime's Stray Military Papers, page 21). The French infantry as well as our own were during the war of the Spanish Succession armed with the socket bayonet, and the long period of infantry predominance on the field of battle had begun.

So much for the authorities relied upon in fixing the dates of the tactical supremacy of various arms upon the field of battle. In justification of the inclusion of the column in a chart the main object of which is the elucidation of the causes of change in fortification, let me quote some preliminary remarks on the subject of Land Fortification from Major Lewis' well-known text-book: "Permanent Fortification for English Engineers."

"Permanent Fortification," says Colonel Hime, in his "Précis of Modern Tactics," "stands on the same basis as tactics, arms and contour of ground."

"This sentence," says Major Lewis, "clearly indicates how we should study the general principles of fortification; that is, as a branch of tactics; and one which, like the tactics of an army in the field, requires change with each change in the power of the weapons in use, and with each new application made of them.

In fact, fortification is the careful preparation of ground in such a manner that the defenders may use their weapons with the greatest possible effect, and with the least interruption from the enemy. All the changes made in fortification have been the consequences of the improvements that have been made in weapons.

It is of the greatest importance always to bear in mind these principles. Most of the errors of Engineers arise from their exaggerating the constructional part of fortification, while those of officers of other arms come from their looking on it as an art somehow distinct from the tactics to which they are accustomed. Fortification is a branch of tactics."—("Lewis' Fortification for English Engineers," p. 4).

One of the objects of this chart is to emphasize this truth, and to show that the study of fortification is merely a branch of the general study of war, that it is intimately connected with the study of tactics, and that its great historical changes have been directly and absolutely dependent on improvements in the science of gunnery. A reference to the chart indeed shows that the larger part of it is devoted to the evolution of Artillery.

Woolwich, I may mention in passing, is an ideal place for carrying on a study of this nature; for besides containing the Arsenal, in which all the latest inventions in Artillery may be seen in process of manufacture, Woolwich possesses by far the finest collection of old ordnance in the country.

The Tower of London contains, I suppose, the second best collection, but it is not to be named in the same breath as the splendid collection in the Rotunda.

The last column in the chart refers, it will be noticed, to typical guns, of wrought iron, bronze, cast iron, and steel, to be found in this unique collection.

Before referring in detail to any of the columns referring to the evolution of Artillery, I would ask you to notice two broad horizontal bands of shade, commencing respectively in the latter part of the fifteenth and nineteenth centuries.

These two bands of shade mark the two most important epochs in the history of fortification and artillery since the invention of gunpowder. A large number of important inventions occur in each epoch; but in each case, one improvement stands out as pre-eminently the leading invention of the time.

The earlier period may be called the epoch of cast-iron shot, the period in which we are now living the period of rifled ordnance.

Each of these great inventions has profoundly modified the theory and practice of fortification, as regards trace, profile, and material used. These changes are noticed graphically, or are entered in the form of notes in the fortification columns on the left of the chart.

As a specimen of one of the artillery columns, let us now take the one descriptive of a typical siege piece from the time of Henry VIII. down to the present day.

The subject is divided up under three headings, the column on the left referring to the variation in weight of a typical siege piece, the second column showing the variation in muzzle energy,, and the third the variation in the effective breaching range.

This triple division of the subject was suggested by the following sentence from Bacon's Essay on the "Vicissitude of Things," published in 1625:—

"The conditions of weapons and their improvements are: First the fetching afar off; for that outruns the danger; as it is seen in ordnance and muskets. Secondly, the strength of the percussion, wherein likewise ordnance do exceed all arietatious and ancient inventions. The third is, the commodious use of them, as that they may serve in all weathers; that the carriage may be light and manageable, and the like."

The column on the left shows that the "commodious use" of a 6-inch howitzer is greater than that of a "culverin" of the time of Henry VIII. The weight of the latter piece—a 20-pr.—is seen to be 43 cwt.; whereas the former—a 120-pr.—weighs only 30 cwt.

Each of these pieces may, I think, be fairly taken as the typical siege piece of its period; in other words the number of "culverins" employed at any siege during the reign of Henry VIII. probably as a rule exceeded the number of heavier pieces such as "demi-cannons," "cannons," or "great curtals," or of lighter pieces such as "sacres" or "demi-culverins"; and at the present day, the number of 6-inch howitzers would probably show the same pre-eminence.

As a matter of historical fact, the 24-prs. of Peninsular and Crimean times were numerically preponderant in the siege trains used before Badajos and Sebastopol

The second column shows how "the strength of percussion," to use Bacon's phrase has increased from about 89 foot-tons—the muzzle energy of a "culverin" of Henry VIII's time—to 505 foot-tons—the muzzle energy of a 6-inch howitzer of the present day.

This comparison of muzzle-energies, although it shows a great increase of power, is hardly fair on the modern piece, which depends less on striking energy than on shell-power. The expression "battering-train," which was a common term in Peninsular times, gave way—after Paixhan's utilization of shell-fire from guns in 1826—to the modern term "siege-train." Even putting this on one side however, the increased power of the modern piece in mere battering capacity is sufficiently striking.

The last column shows how the modern piece has "outrun the danger" by "fetching afar off" to a distance of 4,000 yards as compared with an effective range of 400 yards in the time of Henry VIII.

The data on which these effective breaching ranges were fixed for the different periods were perhaps the most difficult to obtain of all the data shown upon the chart.

It was to a great extent a matter of chance if one hit upon any historical fact bearing upon the question. It will be as well therefore to cite authorities for the ranges given.

At the siege of Sebastopol the first parallel, which contained a great battery of 24-prs. was opened at a distance of from 1300 to 1400 yards from the Redan. There were strong reasons for keeping this parallel as far as possible from the Russian works. These reasons arose from the contour of the ground over which the attack on the south front of Sebastopol had to pass.

The ground sloped continuously downwards from the English position to within a distance of about half a mile from the Russian works; the ground then rose to the position on which the Russian earthworks were constructed.

Another strongly marked topographical feature were the three steep-sided ravines, running roughly north and south which flanked our position on the right and left, and cut it in two in the centre.

The general slope of the ground to the front made it advisable to keep the first parallel as far as possible from the enemy's works, as the further to the front the parallel was advanced the more could it have been seen into from the Russian position. The existence of the ravine on our right flank gave opportunities to the Russians for occupying ground on the far side of it, on our extreme right, from which position our parallel could have been enfiladed if pushed too far forward. Every reason therefore existed for keeping the first parallel with its great batteries of 41 and 27 guns respectively in the left and right attacks, as far back as possible. The distance actually was from 1300 to 1400 yards, which fact is the authority on which I rely for the statement shown graphically on the chart that 1500 yards was the limit of the effective breaching range of 24-pr. smooth-bore guns in 1855.

The Crimean War was the last great war of the smooth-bore period. The invention of rifling and improvements in manufacture have since that time more than doubled the effective breaching range of siege guns, the range shown at the top of the chart being 4000. yards Working back from Crimean times to the early part of the century we find the iron 24-pr. is still the backbone of Wellington's "Battering-train" as it was of Lord Raglan's in the Crimea.

The effective range was, however, not nearly so great. This, I take it, was probably chiefly due to the great improvements in the manufacture of gun-powder introduced by Sir William Congreve in 1815.—(Hime. Stray Military Papers, p. 169). Anyhow 800 yards seems to have been an outside range.

During the second siege of Badajos, on the night between the 31st May and 1st June, 1811, a battery of fourteen 24-prs., four 8-inch howitzers, and two 10-inch howitzers was picketted out at a distance of 800 yards from the Castle.

The following extract from Jones' "Journals of Sieges in Spain" (edition of 1827, Vol. I., p. 51) is descriptive of the action of this battery:—

"3rd June.

"At half-past nine a.m. the batteries opened against the Castle, and their fire was vigorously kept up till night.

"From the excessive windage of the guns and distance from the point to be breached (800 yards), the practice was at first very inaccurate, but by great care and attention in elevating and pointing each piece, the fire gradually became more certain and produced considerable effect, as before evening the outer face or wall of the castle had been beaten down, and a perpendicular bank of earth or clay appeared to be the only obstacle to a breach." A note is added (No. 4 in the appendix of the same volume) to account for "the great distance of the breaching battery from the Castle."

The reason—want of time to carry the approaches nearer—is one that acounts for a great many of Wellington's siege methods.

The original intention was to trace this battery at a distance of 500 yards only from the Castle.

Relying on Jones' evidence, I have marked 800 yards as the effective breaching range of a typical siege piece—the iron 24-pr.—at the commencement of the present century.

Jones, in his preliminary observations, lays down that the first parallel should be opened at a distance of six or seven hundred yards from the ramparts.—(Jones' "Sieges in Spain," Vol. I., p. 11).

In Vaubau's time at the close of the seventeenth century it was ruled that the first parallel should be traced at 600 yards from the enemy's works.—(Hamley's "War in the Crimea," p. 95).

The effective breaching range at this period is, therefore, shown as being between 600 and 700 yards.

The increase in the effective breaching range during the eighteenth century is thus seen to have been very small.

No great improvements either in the manufacture of powder or of ordnance appear to mark this epoch.

Going back another century—*i.e.*, to the close of the sixteenth century—we find the following performances of a 20-pr. "culverin" recorded on p. 9 of Tartaglia's "Colloquies," published in 1588. Point blank range 200 paces. Range at 45 degrees elevation 800 paces." Comparing this with Peninsular performances, it will be seen at once that there is a great difference between an effective breaching range of 800 yards and an extreme range at 45 degrees elevation of 800 paces. The effective breaching range of Tartaglia's "culverin" can hardly have exceeded 400 yards. A hundred years afterwards, as we have just seen, the effective range was something over 600 yards.

This improvement was probably due to the invention of corned powder some time in the seventeenth century.

"There was in ancient time a kind of powder called serpentine," writes Eldred, the Master Gunner of Dover Castle, in 1646, "not corned as the powder that we use in these days."

Siege guns can hardly be said to have existed in the proper sense of the term before the introduction of cast-iron shot in 1480.

The huge bombard of Mahomet II., throwing a stone shot weighing 670 lbs.—a sister gun to which may be seen with two piles of shot at the Rotunda Museum—was actually laid in position before the walls of Constantinople in 1453. It fired seven rounds a day, and then burst.

It was magnificent, but it was not siege artillery, the history of which is, therefore, not traced further back than the year 1500, from which period for the next century the "culverin," as the typical siege piece, is credited with an effective range of 400 yards. We have thus traced backwards the effective breaching ranges of typical siege pieces—the 6-inch. howitzer, 24-pr. iron gun, and the 15-pr., 19-pr. and 20-pr. "culverin," from the present time to the year 1500.

Without going into detail regarding the remaining columns of the chart, I would recapitulate in conclusion the advantages claimed for the graphic presentment of history, as exemplified by the chart we have just examined:—

1.—A general conspectus of the salient features of the history of the art of war can be obtained at a glance.

2.—The action and reaction of artillery and fortification upon one another are clearly brought out.

For instance, the two chief periods in the history of artillery—marked by the introduction of cast-iron shot and of rifled ordnance—each cause a change of trace, and introduce a new material into fortification.

3.—To the student of any particular campaign the chart gives an immediate idea of the condition of artillery inventions and manufacture at the time; it also shows current ideas in fortification. To obtain this information from books would often necessitate reference to many authorities before a clear idea on the subject could be obtained.

4.—A chart which can be hung up, and is therefore always exposed to view, is more easily and readily referred to than a book.

DISCUSSION.

Major R. H. MURDOCH, R.A.:—Colonel Corbett, ladies and gentlemen, permit me to occupy just a few moments with the record aspect of one of these synoptical charts.

Certainly the most efficacious method of awakening interest and conveying instruction to the young military student is the optic and synoptic, exactly as only by combining the synthetic and analytic does the

FE" SYSTEM OF HISTORICAL CHARTS.

IES OF ATTACK AND DEFENCE.

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EVOLUTION OF ARTILLERY AND SMALL ARMS

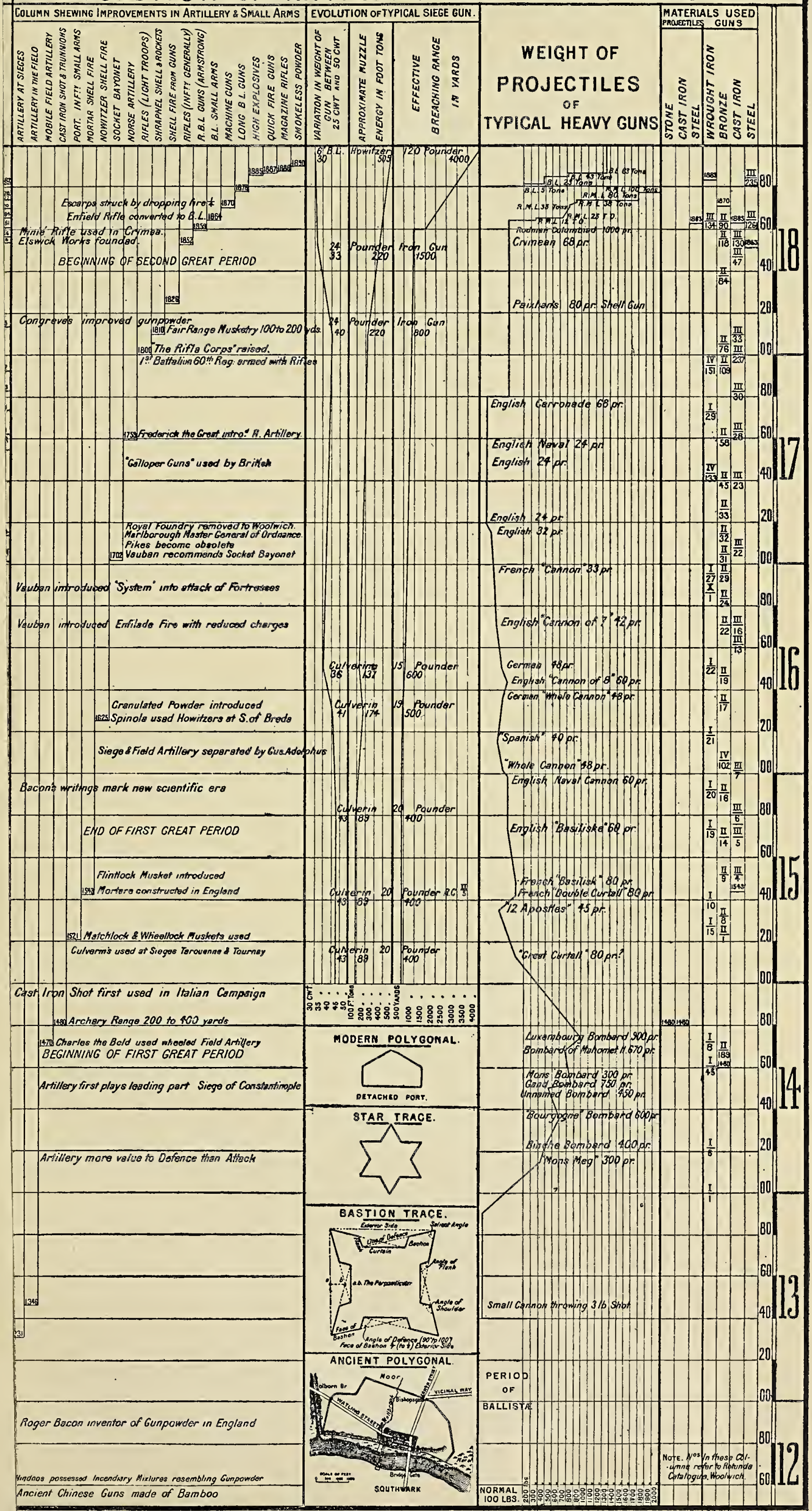

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Fig. 3.

Supplement to R.A.I. "PROCEEDINGS," No. 10, Vol. XXVI.

THE "SCAIFE" SYSTEM OF HISTORICAL CHARTS.

SIX CENTURIES OF ATTACK AND DEFENCE.

Capt. B. R. WARD, R.E., Compiler
J. KELLICK BATHURST, Designer.

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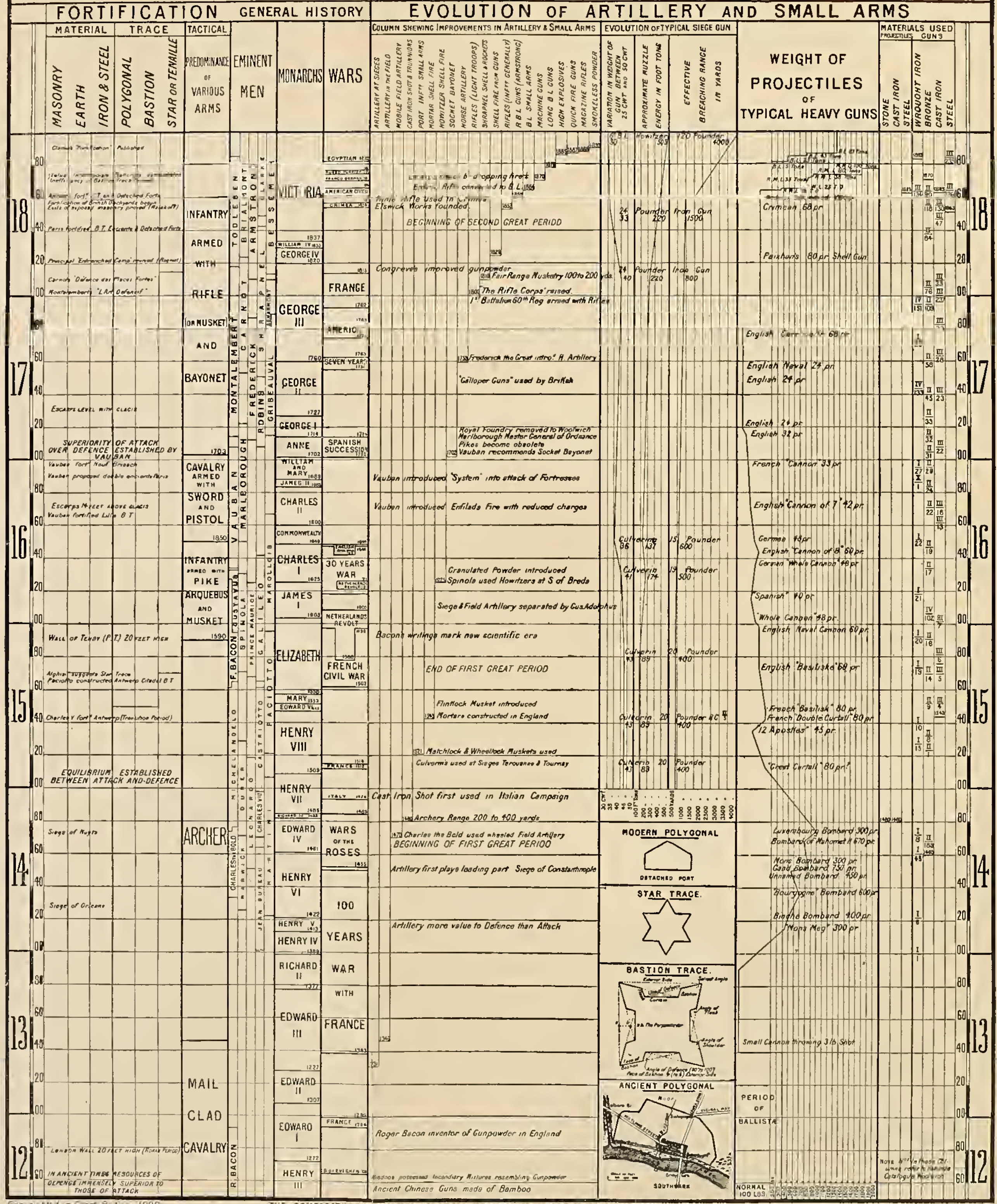

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THE COMPARATIVE SYNOPTICAL CHART CO., LIMITED, 11, LEADENHALL BUILDINGS, LONDON, E.C.

Fig. 3.

To face page 180.

older student evolve those philosophic deductions without which the study of history is wholly unprofitable. But the particular chart which has gained my personal admiration is the extremely ingenious one constructed by the Lecturer, showing six centuries of simultaneous evolution of ARTILLERY and FORTIFICATION. In the records of eternally recurring duels *à mort* between men and men with weapons of war the three most interesting epochs of the highest import are scheduled in that chart under the sections devoted to "Fortifications and General History," and those that come next are under "Artillery." In the first epoch, if we ask the question "When and how came it that Defence, whether by the individual fortressed mobilely in armour or by numbers enclosed by fixed fortifications, began to disappear before unarmoured attack " The chart replies, in 1346, through gunpowder. which, as we all know, ultimately laid the prince in his impregnable fortress of mail at the mercy of the peasant in his shirt sleeves. But when we come to the second epoch and ask the question "How and when came it that equilibrium was established between defensive masonry and attacking siege artillery?" I imagine the chart has to speak with two tongues, somewhat contradictory, if the author will permit me to say so, because it determines the equilibrium epoch at the year 1500, while it shows that the bastion was introduced only in 1550. It is universally admitted that Fortification *versus* Gunnery were in equilibrio when the bastion superseded the early mediæval wall with towers, and it has always vexed the soul of the military archæologist to determine, amid conflicting claims, the crucial date and author of the bastion. I should like to ask the Lecturer whether the vertical column of the "bastion" should not be continued down from 1550 to 1500, so as to coincide with equilibrium or *vice versa.*

When we come to the third epoch and ask the question "When and how did Attack establish its superiority over Defence?" the chart replies in 1690, when Vauban introduced system into Attack and Fortification (those are the words of the answer) and ten years later the superiority of Attack over Defence was established by Vauban. Royal Engineers have legitimate and just ground for magnifying Vauban. Vauban and his Fortification and System, however, have long since been discarded; and it would be of more than academic interest if some Artilleryman were to enquire (which time does not now permit) how Marlborough, *malgré* Vauban himself and his fortifications and system, in every instance overthrew both, and established the superiority of Attack over Defence by resuscitating the arm of Spinola with the tactics of Turenne. The subject has been only faintly broached in the "Proceedings" of our Institution, and our so-called histories of Artillery deal not with the evolution of Artillery *matériel* and tactics.

Turning to the sections of ARTILLERY; after the most minute examination, I can only now suggest that the heading "Shell fire from guns" might read "'Shell fire from guns by ships of war." The vertical column will be seen to relate only to one item in 1826 when Colonel Paixhans introduced shell fire from guns in the French Navy from ships of war as distinguished from mortars in bomb vessels. The land service shell gun is shown lower down in the chart, 1625, when the howitzer was adopted in Europe first by Spinola.

Lastly, under the horizontal line 1815, devoted to Congreve, should be added, "1813 Rockets (Congreve's) first employed in the field in Europe by British Royal Horse Artillery."

Mr. SCAIFE:—Colonel Corbett, ladies and gentlemen, I am sure I am only voicing the sentiments of all present in saying how much we have enjoyed the lecture. I myself have enjoyed it possibly more than anybody else because as the inventor and patentee, if I may use the expression, of the system, I naturally take a more than ordinary interest in it. I would like to tell you, if you will allow me, how that original chart came into existence, and how my attention was directed to the desirability, I might almost say the necessity of providing something of the kind. I was at a public school—it would be invidious to mention its name—in England some 30 years ago, when I was solicited by my fond parents to defend my country by entering into the service of the Navy. I was only too anxious to do so, and my parents wrote to my school-master to ask if it would be necessary for me to go to a crammer's or whether I was sufficiently advanced to pass the examination without participation in that feast of reason and that flow of soul provided at these establishments. The answer they received was that I should pass the examination when the time came without such extraneous and expensive aid. I, of course, felt very pleased to think that they thought so well of me, but when I went up for the examination, far from passing with flying colours I regret to say, (and I hope you will receive the confession in confidence) I was ignominiously plucked—I did not even pass the test examination. I had very good marks in some subjects I afterwards learnt, but in two, namely, geography and history, I did not get any marks at all. You can imagine the kind of reception that awaited me at home. I felt very keenly about it mentally and, if I remember right, physically too. The whole question was a very sore subject for many a long day. But after all there were extenuating circumstances; it was not all my fault, because I had not been taught those subjects, and you now know why I do not mention the name of the school. It is 30 years ago and as a matter of fact they did not teach geography, or history then as they do now, and in both of those subjects, unfortunately, I had to return a blank paper. Time went on, the country lost the value of my services and I went abroad, but I kept thinking this thing over, and out of "sheer cussedness," as they say out west, I took to reading history, and after I had read a good many histories and given a good deal of time to the subject, I used to ask myself, "How much do I know about it." I could look upon a map of the world or of any country and I could get as the lecturer has told us, a synoptic idea of it. I did not have to go to Sicily, for instance, to know its shape or position, I could see it lying like a football at the toe of Italy, and the same with regard to other countries. It seemed to me then that if I could devise some method of learning or teaching history analogous to a map in geography, at least the effort was worth the making. That chart which you see on the board there was the result. It took a great deal of time, and I do not say it is perfect, but I hope it is something in the right direction. And later on when I had the privilege of delivering a lecture on that very subject at one of our public schools the form-master was good enough to let the boys write what he called a theme upon the subject, and to send me their essays. After I had read some twenty out of the whole number I was perfectly convinced that the object I had in mind was in great measure gained, because "the boys," as they say in the States, "had caught on." I think that very often we are apt to attribute too great an importance to the opinion of the teachers and not enough importance to the opinion of the taught. I know in the case of my own children, who have up to the present been educated on the other side of the Atlantic, when they came home and I asked their opinion as to the qualification of a certain teacher, I never found that they made a mistake; they knew in one day whether the teacher could teach or whether he could not.

Everybody, of course, is not in favour of a diagrammatic form of imparting knowledge, and I never shall forget an experience that I had with an old gentleman with whom I had taken infinite pains to describe the system and had given, as I thought, an extremely interesting lecture on the subject of English history for several hundred years in 10 minutes. He said "Yes, lots of people might think well of that system but in my young days we never wanted anything of the kind, we used to have a little system of rhymes whereby we always remembered dates, the consequence is I never forget a date." I said "That is excellent; could you give me an example?" "Why, certainly" he replied, "William the Conqueror's date we fix at," then he paused—"at" "Yes," I said, "Yes"—"at 1476." I said, "That, of course, is an admirable plan, but it does not quite agree with the generally accepted theory. The chart, for instance, says "William the Conqueror, 1066." "Well, anyhow I knew it was six," he said, (laughter).

Lieutenant H. CHAMBERLAIN, late Royal Navy, made a few remarks in support of the Scaife system, and, being himself in the educational line, he employed a kindred system of diagrams in teaching, based on the same root idea, viz., that you must teach by the eye and not merely by the ear

REPLY.

Captain B. R. WARD:—With regard to Major Murdoch's remark as to the introduction of the bastion trace being brought down from 1550 to 1500, I see no objection at all to that. As regards the earliest adoption of this trace it is very difficult to discover exactly who was the first man who constructed a work on the bastion system. The authority I went by was the "Traité Historique de Fortification" of Villenoisy.

He states that Paciotto in 1550 or within a few years of that time, constructed the citadel of Antwerp on that system. Bastions had been constructed for some time before, but no complete bastioned front had, according to Villenoisy, ever been constructed before. I think it might however perhaps be put back another 50 years to coincide with the equilibrium that Major Murdoch speaks of.

As to the statement about the introduction of "system" by Vauban in 1690, it would no doubt be better to ante-date this somewhat. That remark was intended to refer to the whole of Vauban's active life. The remark might perhaps be more appropriately placed opposite the date 1669, when he wrote his "Mémoire pour servir d'Instruction dans la conduite des Siéges."

With regard to his establishing the superiority of Attack over Defence, which I think he did, he did it not only as an engineer in the attack but as an artilleryman. Vauban, according to Villenoisy, was not only the greatest engineer but also the greatest artilleryman of his time.

With regard to the entry under 1826, "Shell fire from guns," I think it is an excellent suggestion that the words "by ships of war" should be added, because undoubtedly, shell fire from howitzers is nearly the same thing as from guns and the former is shown on the chart as early as 1695. I think in any new edition we might vey properly add those words, and a note as to the introduction of Congreve's rockets in 1813 might well be inserted under the heading "Artillery inventions." I have to thank Major Murdoch for his suggestion.

The CHAIRMAN:—Ladies and gentlemen, it now only remains, I think, for me to thank the lecturer on behalf of everybody for the very interesting and pleasant lecture which he has given us to-night. I do not feel equal myself to discussing the affair, as never having had anything to do with teaching, and it being so long ago since I was taught. I really do not remember much about it, therefore I will simply convey on your behalf our thanks to the lecturer for his very able lecture (loud applause).

THE SERVICE OF QUICK-FIRING GUNS IN COAST DEFENCE.

BY

CAPTAIN G. TYACKE, R.A.

Primitive Laying.

WHEN the science of gunnery was in its infancy, laying was an affair of knack and judgment. A notch on the muzzle swell and another on the breech ring sufficed to give direction while the elevation given was "about as much as you'd think would do." Salvation Yeo, trained layer as he was, would have considered sights of any kind a needless complication.

Gradual Growth of Exactness.

As guns gradually attained to some degree of regularity in shooting, in due time tangent sights were invented, improved, divided and sub-divided, and side by side with them grew up a family of index plates, elevation indicators, multipliers, clinometers *et hoc geuus omne*, all tending towards greater accuracy in giving exact and pre-determined elevation to the guns.

Incidentally they contributed also to the painful slowness of the fire, but at this epoch mathematical exactness held the field and the era of quick-fire had not dawned.

Return to more elementary methods with advent of Q.F. guns.

When quick-firing guns came in, with their revolutionary simplicity, dispensing with range-finders and all their paraphernalia, scorning 'predictions,' keeping a patter of shots falling about the target and so getting on and keeping on it by simple observation and correction, I think some excellent Artillerists were slightly shocked and talked about 'waste of ammunition.' There is a worse evil than this though, and that is *waste of opportunities.* No one, at the present time, when the powers of war vessels for attack and running past are so vastly increased, will be found to argue for deliberate fire during the fleeting movements that the opportunity offers. Rather squander ammunition while you may; the more rounds are fired the more chances of correcting the shooting. Of course, the guns must be really and consistently laid each time, or ranging becomes impossible.

Quick laying is the secret of rapid fire.

Normal process of laying.

For the moment putting Automatic sights out of the question, the normal process of ranging without instruments on a target which is rapidly approaching, consists in establishing a succession of shell-swept areas in front of it, through which it has to pass, while the guns continue to fire with the same elevation. The degree of danger to a torpedo-boat while passing through these areas will naturally depend upon the accuracy of the laying and the rapidity of the fire, and the duration of the danger period depends upon her own speed. Once beyond the dangerous area the boat is safe until another is established in front of her, that is until the elevation has been reduced and fire opened at the new range.

A succession of dangerous areas.

Of course it is the object of the Q.F. guns to diminish, and finally to eliminate these periods of immunity which the boats enjoy while the sights are being altered.

The auto-sighting system is the ideal.

They are completely eliminated by the use of Auto-sights, since the necessary correction is made at every round in the act of laying the gun, and the shooting depends only upon the personal qualities of the layer and the fundamental accuracy of the gun and ammunition.

For those Q.F. guns however which have not been, or for any reason cannot be, fitted with Automatic sights there remains only the plan of ranging by observation, and reducing elevation at intervals depending on the rate at which the range is lessening. This may be called the 'step-by-step' system.

Disadvantages of the "Normal Process."

There is much scope for exercise of judgment on the part of the Gun Group Commander; for if he makes the 'steps' too long, shots will be wasted in the interval befre the boat reaches the dangerous area, or after she has passed out of it; if he makes them too short a great proportion of the time available for shooting will be consumed in adjusting sights, fire being stopped to enable orders to be heard. If the latter fault be carried to extreme, especially with slow layers and setters, the boat may have passed inside the dangerous area before a shot has been fired into it, when of course a further delay is caused by a fresh lay being necessary.

In the above paragraphs the case of an *advancing* boat has been taken for the sake of convenience, but the same principle applies to one *retiring*, the dangerous area being established *ahead* of her in all cases.

The Setter and his functions.

The Setter was introduced into the gun detachment that the Layer's attention might not be distracted from the target by having to re-set the sight and to be on the look out for orders relating to it.

His difficulties.

In the exercise of his functions the Setter somewhat impedes the service of the gun and makes one more number exposed to fire. According to the method now taught, when a new range is given out, in order to set the sight correctly the Setter has to put his head where it interferes with the Layers' view, and his shoulders obstruct the loading. This refers to the 6-pr. and 3-pr. Q.F. It is a fact, though it is at present unnoticed in the drill-book, that with L.S. 12-pr. Q.F. guns a Setter cannot possibly be employed, as there is no room for him inside the shield where he could see or reach to set the sight.

And limitations.

School of Gunnery Report 1898.

In the "Report of the School of Gunnery, 1898," p. 18, it is stated that the system of setting the 6-pr.

sights at night by the light of bull's-eye lanterns 'is not practical or convenient.' It was found that after a little training the setters were able to set their sights *without looking at them*, with considerable accuracy.

The para ends :—" By this means the rate of fire is considerably increased and independent fire could become the normal method, even without automatic sights, for well-trained men."

Method in use in the Royal Navy.

This plan of allowing the Setter to range the gun and keep the elevation correct by watching the target and turning the sight up or down as the shots fall short or over, has been in use in the Royal Navy for several years, to the writer's knowledge.

Shooting depends greatly on Setters judgement and skill in manipulating sight.

By this method of ranging it will be remarked that no use is made of the yard scale on the tangent sight (after the first round) but the Setter puts up 'about as much as he thinks will do,' much as the Elizabethan gunner did. It is a question whether our Setters, with the small amount of practice they get with service ammunition—aiming rifle practice would be apt to lead their judgment astray—could be brought to the necessary pitch of training, without some mechanical aid, for adjusting the sight without seeing it.

Object and description of Aid to Sight-setting during rapid fire.

Before having read the Report of the School of Gunnery, the writer, thinking over this question, had devised a simple means of giving the Setter an idea of how much scale he is putting up.

The device is merely to introduce into the sight socket a " click " arrangement, consisting of a blunt chisel point which is kept pressed by a spring against the toothed rack of the tangent sight bar. The point is so shaped as to jump over the teeth of the rack whether the sight is raised or lowered, and when it is, does so, and there is a 'snap' easily perceptible and audible to the Setter.

The tangent scale for the first round is set at the range in yards as estimated or otherwise obtained, but afterwards it is not proposed to use the yard scale at all.

The proceedure would be as follows :—

Method of use

The Setter stands so that he can reach the wheel of the sight, and watches the group officer ; he turns the sight up or down through one or more notches according to the signals or orders given by that officer.

and proposed modification of drill.

The gun group commander, observing the splashes, motions with his hand up or down, according as the sight is to be raised or lowered, the number of movements indicating the number of notches to be passed over. At night, orders, such as " Up one," " Down two," would take the place of signals.

It is claimed for this system that—

Advantages claimed for proposed system.

(1).—It retains the control of the fire in the hands of the Gun Group Commander, instead of allowing Setters to do the ranging of their guns, as would be the case in independent fire.

(2).—The sight is set more quickly than can be done at present, especially at night, and no lamp for the Setter is required.

(3).—The Setter does not interfere with the service of the gun.

(4).—There is no interruption of fire on change of elevation. Ranging by signal makes the whistle and word of command unnecessary.

Objections anticipated.

In this ranging by notches—as the teeth of the rack may be called for the sake of brevity—it will doubtless be objected that the value of a notch in yards constantly diminishes from the shortest to the longest ranges. In the case experimented with—the 6-pr. sight—a notch corresponds to about 100 yards between the ranges of 500 yards and 1500 yards, and there is enough friction in the sight gear to allow of a setting half way between notches if required. However, past experience with fast targets has shewn it to be undesirable to alter elevation at smaller intervals than 100 yards, and for the principal Q.F. fighting ranges one notch gives this interval approximately.

Drill by signals.

As to the proposed innovation of substituting signals for words of command in the day time it appears quite feasible, though the writer has not yet tried it, and it is rendered possible by diverting the Setter's attention from the tangent scale on to the Gun Group Commander.

Change of deflection might be signalled in the same way—each wave right or left being taken to mean 10 minutes.

By these means 'Rapid fire' might be continuous, and uninterrupted by change of elevation and deflection, which would be a distinct gain, for the dual system of instruction now authorized tends towards uncertainty as to which method should actually be employed in action.

Conclusion.

In conclusion, I have only to state that the "click" arrangement is by no means a 'complication.' It does not affect the ordinary working of the sight, except beneficially, by lessening the tendency of the bar to slip down during firing.

It can be fitted at trifling cost to all 6-pr. and 3-pr. sockets.

A PLEA FOR "JUMPING."

BY

CAPTAIN W. P. SAUNDERS, R.A.

]The Committee, although not agreeing with the method of ranging brought forward by the writer of this paper, consider the subject an important one, and trust its publication may draw attention to the necessity for a more rapid system than that now in vogue, and lead to further suggestions. Secretary R.A.I.]

AS, by the present system of ranging and trial fuzes, more than half the time of an ordinary competitive series is wasted before really effective Shrapnel are put in, the following suggestions are made with a view to reaching " Battery fire " a little sooner.

The times of firing of each gun of a well drilled battery, in an ordinary series, might read approximately as follows :—

No. of gun.	Mins.	Secs.	Range.	
1	0	35	2000 yards	
2	1	15	2200 "	
3	1	55	2100 "	
4	2	35	2150 "	
5	3	15	2175 "	
6	3	55	2175 "	
1 2	4	10	2175 "	Fuze 9½
3 4	4	50	2175 "	Fuze 10
5 6	5	30	2175 "	Fuze 9¾
1	6	00	" Battery fire at 10 secs." :—Commence and 24 rounds in all be fired at 7 mins· 50 secs. by the watch.	

The interval of 40 secs. between rounds might approximately be made up as under :—

Time of flight—about 6 secs.

Time of observation, Battery Commander making up his mind and estimating necessary correction—9 secs.

Passing orders—3 secs.

Setting sights and completing the laying—20 secs.

Time of firing, 2 secs.—Total about 40 secs.

With all diffidence I put forward the following suggestion, that instead of as at present in the drill-book, the Battery Commander's orders might read :— ...

"Right section, 2000 yards, and 2200 yards," and, after observation, "Centre section, 2100 yards and 2150 yards," followed, after observation by "Left section, 2175."

Section Commanders would order correspondingly :—

Right section, "No. 1, 2000 yards, No. 2, 2200 yards" ; Centre section, "No. 3, 2100 yards, No. 4, 2150 yards" ; Left section, "Nos. 5 and 6, 2175 yards."

At the signal for "shot," 2 guns of a section would be fired together, or in rapid succession.

Times of firing the guns would then read :—

	Mins.	Secs.	Range.	
1	0	35	2000	yards
2			2200	„
3	1	15	2100	„
4			2150	„
5	1	55	2175	„
6			2175	„

or a saving in time of 2 minutes on completion of the ranging—extra pairs could be fired either for bracketing or verifying, at a saving in time of 40 secs. for each pair.

To judge distances within 200 yards from short to medium ranges and to expect the range-finders to be correct within 300 yards : at medium to long ranges would not perhaps be asking too much of Battery Commanders.

The incorrect laying of any individual round would be more easily detected, being checked by the other round of the pair.

The above need not affect the examples in the drill-book, "where speed is a great object," or "at ranges up to 1000 yards."

Fearing that the ideas put forward may savour too much of what camp commandants call "Jumping," I dare not further suggest, that, after careful observation of the first pair of fuzes *which burst in the air*, the Battery Commander might be allowed to say "——— Section, Fuze——— ; ——— Section, Fuze———" fire them by pairs in rapid succession, select from these the length of fuze he likes best, or, if not satisfied try some more—and commence "Battery fire"—saving 40 secs. on his first six trial fuzes.

Now that the question of Q.F. field guns is so all important—the above suggestions might enable batteries to get to battery fire quicker than heretofore, without in the opinion of the writer decreasing their "effect"—and doubtless the improvement to the equipment will do the part that is needful after "Battery fire" has commenced.

THE ANCIENT DEFENCES OF THE ISLE OF WIGHT

BY

CAPTAIN S. G. HORTON, R.A.

THE following notes on the Defences of the Isle of Wight, as they existed in 1600, are extracted from an old history of the Island, published in Newport, in 1795, a copy of which is in the Officers Mess Library, at Golden Hill, and it is thought that they might be interesting to those officers who have served in the Western Forts.

The account of Hurst Castle is taken from a History of Hampshire by Warner, published about the same time.

CARISBROOKE CASTLE.

The first mention of the present fortress is in the reign of Edward III., about 1350, when Sir John de Langford, the Constable of Carisbrooke Castle, and two other Knights, were appointed wardens for the defence of the Kingdom. In the reign of Richard II. the French effected a landing on the Island, and the inhabitants flew for refuge and security to Carisbrooke, which was defended by Sir Hugh Tyrrel; whither the French pursued them, and besieged the Castle. Great numbers of the assailants were slain in this siege; and a party of them, in attempting to force their way close to the Castle, with more courage than discretion, were cut off by an ambuscade, which had been formed to intercept them.

In 1387, many of the inhabitants of the Island, in consequence of an invasion which was then threatened on the coasts of the Kingdom, and probably from their own recollection, or the information of their forefathers, of the mischiefs experienced on those occasions, entertained serious thoughts of withdrawing from the Island. Continually exposed to these depradations, from their defenceless state, and the proximity of the opposite shore, preparations were made by many to retire to a less turbulent situation. But these intentions were defeated by the King's writ to the Lieutenant of the County, to Hugh Tyrrel, keeper of the Castle of Carisbrooke, in the said Island, and to John Griffith, the constable of the said Castle; whereby all persons were commanded to remain in the Island, and to prepare themselves to defend it against all opposition.

The King, at his own proper costs and charges, supplied the Castle of Carisbrooke with considerable stores and provisions; amounting to 10 tuns of wine, and 100 quarters of wheat, the same quantitv of malt, half the quantity of beans and pease, and 100 quarters of oats, besides salt, coals, wood, and other necessaries for the support of its defenders.

In a catalogue of men and archers, we find 54 men at arms and 141 archers or bowmen. At this time, five men at arms and twenty bowmen were furnished by the Churches in the East Medine (that part of the island lying to the east of the River Medine, and still so designated, 1899), and four men at arms, and twenty-three archers by the churches of the West Medine. The King sent 100 slingers and bowmen, and the City of London 300. A record or roll is in existence, which contains the names of all the officers who were told off to command the militia of the Island in different parishes and districts. The Warden of the Island at this time appears to have been posessed of great power and authority. He was authorized to " array " the men at arms, or probably horsemen, hoblers, who were light armed soldiers, and mounted on small horses called " hobbies," and bowmen or archers, as well as all others, both horse and foot. He was instructed to levy new forces if it was found that the existing ones were insufficient, and to take men from the County of Southampton. Absentees, on failure to appear within a limited time, had their lands and tenements, goods and chattels confiscated and forfeited to the use of the King.

Towards the latter end of the reign of Henry VIII., about the year 1543, the French made an attempt to destroy the English fleet. Failing in their attempt, they made a descent on the Isle of Wight, but they were driven back.

The necessity of some form of Coast defence was thus made apparent and the Captain of the Island, Worsley, had several forts constructed on the coasts of the Island. One of these in particular was called Worsley's Tower, on Norton Common, on the coast immediately opposite Hurst Castle, and still known (1899) as Tower Point.

Captain Worsley's exertions were most effectively productive of the means of defence.

From a return made to certain commissioners in the first year of Edward VI., we find the ordnance and ammunition distributed as follows:—

YARMOUTH CASTLE

Richard Ewdall, Captain in 1543.

The following list of ordnance stores in possesion is given :—

12 pieces of brass and iron ordnance of different calibres,
1 broken.
291 shot, of which 50 were stone, and 50 a mixture of lead
8 half barrels, and 3 double barrels of powder.
19 hagbuts , and half a barrel of common powder.
150 bows.
2 gross bowstrings in a firkin.
240 sheafs of arrows.
223 bills.

CARISBROOKE CASTLE

Richard Worsley, Governor of the Isle of Wight.
5 pieces iron ordnance.
520 shot of various sizes.

23 double barrels and 3 firkins of powder.
140 hagbuts, having only 120 stalks and touch boxes.
4 double barrels of corn powder.
600 coils of lint.
59 chests of arrows.
21 chests of bows.
3 barrels of bowstrings.
500 Morris pikes.
284 Javelins.
750 bills.

WEST COWES CASTLE. (Now Royal Squadron Yacht Club).

BARBICAN.

6 pieces of ordnance, 1 unserviceable.
148 shot of different calibres

WEST WING.

3 pieces, unserviceable.

MAIN TOWER.

210 shot.
1 double barrel and 2 firkins of powder.
10 unserviceable hagbuts.
4 lbs. of corn powder.
19 bows.
32 chests of arrows.
22 picks.
20 bills.

BLOCKHOUSE AT SHARPNODE (Sconce Pt., now Ft. Victoria).

2 pieces brass ordnance.
44 iron shot.
1 double barrel of powder.

CASTLE AT SANDHAM BAY (?Sandown Bay).

11 pieces brass and iron ordnance.
605 shot of different sorts and sizes, as iron, a mixture of lead, and stone, with hollow shot for wild fire, and 28 cases of hail shot for port pieces.
3 double barrels and 1 firkin of powder.
78 hagbuts, but without stalks and touch boxes.
1 firkin of corn powder.
1 chest of bows.
1 chest of arrows.
150 picks.
120 bills.

STAFF AND THEIR SALARIES.

In 1558 the Staff and their salaries were:—

	£	s.	d.	
Governor of Island	500	0	0	per annum.
Lieut.-Governor	365	0	0	„
Captain of Castle 10s. per diem...........	182	10	0	„

1 Master Gunner, 2s. per diem..........	36	10	0	per annum.
3 Gunners, at 1s. per diem..................	54	15	0	„
Reparations made at Yarmouth in 1587 cost.........	50	7	7	

Reparations made at Freshwater, Sharpnode and Carey's Sconce in 1558, £130 5 2.

The garrison of Sandown Castle was in that year:—

1 Captain at 2s. 6d. per diem.
12 Warders at 8d. per diem.
1 Master Gunner at 2s. per diem.
3 Gunners, each 1s.

There were allotted to Carisbrooke, West Cowes, Yarmouth and Sharpnode, with Worsley's Tower forming apparently the District Establishment:—

1 Armourer at 8d. per day.
1 Harquebut maker at 8d. per day.
1 Armourer at 6d. per day.
1 Boyer at 6d. per day.
1 Fletcher at 6d. per day.
1 Carpenter at 6d. per day.
1 Wheelwright at 6d. per day

The annual expense at Carisbrooke was £69 19s. 4d.
At other forts £118 12s. 6d.
Also £281 8s. 4d. to the Captain at 6s. 9d.
His Deputy at 2s.
13 Servants at 6d.
Keeper of the forest at 2d.
Total annual expense for the Island £567.

When England was threatened with the Invincible Armada from Spain the Island became a peculiar object of attention. Sir George Carey, afterwards Lord Hunsdon, and a near relation of Queen Elizabeth, who was at that time Captain, and was in reality the first person who assumed the title of Governor, issued orders similar to those which had been issued in the reign of Edward III. as to the defences.

In 1638, the Earl of Portland was Governor, and lived at the Castle. When the rupture broke out between the King and Parliament, Phillip, Earl of Pembroke, was appointed Captain in his stead. The Countess and her family however, continued to reside there, with a Colonel Brett as custodian. The Mayor of Newport, whose name was Read, said he could not answer for the safety of the Castle if the Colonel and Countess continued to remain there. Four hundred men were therefore landed to join the Militia at Newport, and with Read in command proceeded to besiege the Castle. There were only 20 men with Col. Brett

The Countess mounted on the platform with a lighted match in her hand, and made a speech to the besiegers, saying she would defend the Castle to the last extremity, and fire the first gun herself, unless they would grant honourable terms of surrender. The besiegers thought it better to negotiate, and the Castle was surrendered.

At this period the militia were told off into small watch parties, each under a Centoner, whose duties were to keep a look-out from elevated spots on the coast for hostile ships. There were two beacons, one at

Ashey Down and one at Nodes Down, which were to be lighted if the enemy came in sight. Each parish provided a field gun on a carriage which was also in charge of militia.

The original Castle of Carisbrooke is supposed to have been built by William Fitzosborne, Earl of Hereford, soon after the Norman conquest. It appears in Domesday Book that it occupied a virgate (20 acres) of land. The walls originally occupied a space nearly in the form of a rectangled parallelogram with the angles rounded, of an area of an acre and a half.

On the north-east angle there is the date 1598, and on the south-east 1601. Queen Elizabeth added the outworks, consisting of an irregular pentagonal breastwork, faced with stone, with five bastions. These are surrounded by a deep ditch. They were said to have been designed by Genebella, an Italian.

The entrance gate was repaired and improved by Elizabeth in 1598.

The second gate was erected in the time of Edward IV. by Lord Woodville, about 1465.

The principal buildings of those remaining, were no doubt, built by Elizabeth. Some of the accounts, audited by William, Baron of Burleigh, are rather quaint:—

	£	s.	d.
Empcons and provisions, viz., for Boordes, 103 foote...	0	5	5
Carriadges, 2, viz., one for the Cannon Pewtrell with yron woorke to the same £1 4 7			
And one for the Culveringe 16s. 8d. in all..............	2	1	3
Bricks, one thousand with carryage 4 myles		13	0
A myll to grynde corne, bought of Frauncis Porke of Winchester	6	6	8
Heare one Quarter		2	0
Joyned Table one		6	0
Whelebarrowes, 50 at 1s. 6d. the pece..............	3	15	0
Pypes to keep the water for the Morter, 2 at 2s. 6d. the pece		5	0
Bowdg (budge ?) barel one, and for mending and hopinge a water tubbe		2	0
Wellropes, 2 poiz. 300½ at £1 1s. 6d. per medm. £4 16s. makinge out newe rope and tarringe of the same 17s. 4d. and for a rope for the watch bell 12d., in all with £1 7s. for a newe rope for a gynne, the some of..............	7	1	4
Lambskinnes for sponges, 6..............		2	6
John Hasell for making a treade whele for the well with the Gudgeons Shafte and other iron and carpentrie woorke about the same, and a platforme over the well-house by agreement	16	0	0
John Mathewe for paving the well-house and makyng the synke through the wall..............	2	0	0
John Hazell for digging the trenches for the well whele and frame thereof and for the key boltinge of the whele, removing the frame of the whele to serve for 2 bucketts, and makinge a great duble doore to the kepe..............	1	5	0

The total expense of these alterations and additions came to £470 18s. 5d.

At the same time, works were being carried out at Yarmouth and Freshwater.

Yarmouth:—

The cost of the works at Yarmouth was £50 7s. 7d. The Castle was originally built by Henry VIII. out of the stones of Beaulieu Abbey.

Freshwater, Sharpnode, or Carey's Sconce:—

It was thought desirable to repair the defence opposite Hurst Castle, as Worsley's Tower was then going to decay, and had probably only been erected as a temporary defence. Sir George Carey, instead of the site of the Tower, chose a point of land called Sharpnode, about half a mile nearer to Yarmouth, and there erected an earthworrk whch he called Carey's Sconce, at a cost of £651 11s. 2½d. The point is now called Sconce Point, and is the site of the present Fort Victoria.

Sandown Fort:—

This fort was a quadrangular building, flanked by four bastions, and encompassed with a ditch. It stood a long way to the south of the present fort, and its site is now covered by the sea. It was also built by Henry VIII. out of the stones of dismantled monastical establishments. It was considered one of the most important works, as it commanded the Bay.

Cowes Castle:—

Built by Henry VIII. at the same time as Yarmouth and Sandown. It had a semi-circular battery, mounting eleven 9-prs., with rooms for the garrison in a building behind.

This is now the Club House of the Royal Yacht Squadron.

Hurst Castle:—

This ancient fort was built by Henry VIII. out of the stones of Beaulieu Abbey. There is a mason's mark over the entrance door to the central tower, bearing date of 1585. The first Governor was Thomas Bertie, Esqr., of Berstead in Kent, an ancestor of the Duke of Ancaster. He was made Captain of Hurst Castle during the latter end of the reign of Henry VIII., and was still there in 1550. Charles I. was brought here from Carisbrooke on 6th December, 1648 and confined in a small room about 6 ft. by 4 ft., with a window about a foot square, in the central tower of the Castle. After 27 days confinement here, during which his sole exercise consisted in walking up and down the beach, he was removed to Windsor Castle, and then to London for his execution.

Paul Atkinson, a native of Yorkshire, born in 1655, a Popish priest, was confined here for 30 years, and he died on 15th October, 1729, and was buried in St. James' Churchyard, Winchester. The Captain at this time was a Mr. Dore, who is said to have treated Atkinson very kindly.

The ground plan of the Old Castle was a trefoil, with a central tower, the three lobes forming towers on the north-west, south-west and east sides

FEB 16 1900
PATENT OFFICE

THE EMPLOYMENT OF THE 5" B.L. HOWITZER.

BY

MAJOR E. G. NICOLLS, R.A.

THE 5-inch B.L. Howitzer appears to have been designed with the intention of providing a piece of ordnance for use in the field for certain specific purposes, viz., (*a*) for the destruction of *matêriel*, field fortifications, etc. ; (*b*) for the attack of troops in deep shelter trenches, or under cover, which cannot be searched by the ordinary field guns. These objects are effected by using large capacity Common shell filled with high explosive, and small, and varying charges which give a low initial velocity, a curved trajectory, and an opportunity of altering both to suit requirements, which are the peculiar properties of howitzers.

This howitzer was issued to the Field Artillery in 1895-6. There is now a Brigade Division of Field Howitzers quartered at Woolwich, and under orders for South Africa. The details of the organization and equipment of this Brigade Division and its Ammunition Column will be found at pp. 130 to 135 "War Establishments, 1898."

The 5-inch B.L. Howitzer is now, 1899-1900, being issued to the Siege Train Companies, which have lately been re-organized as to their *personnel*. The details of this new organization will be found in "Regimental Establishments, 1899-1900," and in "R.A. R.O., 49," of 1st April, 1899.

In these orders nothing is said as regards the equipment of the Siege Companies, and it will therefore be as well to mention that by W.O. Letter, 54/Arty./7656, dated 21st January, 1899, an equipment of 5-inch and 6-inch B.L. Howitzers is provided for each company. The detail of the equipment as regards the 5-inch howitzer is given in the following table. It must be observed that each Siege Company is intended to provide the *personnel* for two complete batteries of 5-inch howitzers of 6 guns each. One battery is in permanent charge of the company, the other together with the necessary harness is kept in charge in peace-time of the Army Ordnance Corps as mobilization equipment; the horses and drivers required would be furnished from the reserve.

Detail of Equipment of 5″ B.L. Howitzer with Seige Train.

Unit.	Howitzers.	Carriages.*	Wagons, ammunition.*	imbers.*	Forage.*	Store.*	For ammunition.*	For stores.*	Ammunition 500 rounds per piece.	Ammunition carried per unit.	Harness, sets of*	Remarks.
5-inch B.L. Howitzer. 1 Company to be composed of two Batteries. ...	12	12	18	30	2	2		4	6000	1056	258	*Pole draught.
Each battery consisting of	6	6	9	15	1	1		2	3000	528	129	

If we compare this table with those given in War Establishments we shall see that the equipment of a battery of the Siege Train Unit is exactly similar to that of a battery of the Field Howitzer Brigade Division.

The Siege Unit is the Siege Train Division which consists of 2 Siege Companies with their equipment, or 24 howitzers in all.

It seems quite a natural question to ask one self why, when the same gun is used and batteries equipped in the same manner, it is thought necessary to provide such batteries from the two different branches of the Royal Artillery.

The idea that governs such an arrangement would seem to be that these howitzers may be required—

(*a*) For use with an Army in the field.

(*b*) For use in work that is of the nature of siege operations.

and that obviously they must for each of these purposes be used by that branch of the Artillery which is usually associated with the operations in question.

If this is the idea it seems to me to carry with it assumptions which in my opinion are not warranted until definite answers are given to the following questions:—

(1).—Are the probable uses of the 5″ B.L. Howitzer in field and siege operations so different as to require different methods of employment?

(2).—Which Corps the Field Artillery or the Siege Artillery is best suited by its training and proclivities to use the howitzer with the greatest effect?

As regards (1) I think it will be admitted that in minor affairs, in advanced or rear-guard actions, and in reconnaissances howitzer batteries would be of little value, and that their use with a Field Army would be confined to the more important operations, the attack and defence of carefully selected, and strongly prepared positions where it was intended to destroy earthworks, field defences of any description, or to shell troops behind cover, which owing to the comparative flatness of trajectory could not be searched by field guns.

In a regular Siege the principle work that would be required from 5″ B.L. Howitzer Batteries would be work in the field under similar conditions as when employed with a Field Army, viz.:—

(a) In the preliminary operations to drive the enemy back from the ground it was intended to seize.

(b) To attack the enemy's advanced infantry position which would probably be fortified with field redoubts and entrenchments, and include houses, farms, woods, etc., placed in a state of defence.

Further uses for these howitzers which may be considered purely siege conditions are:—

(c) To shell the enemy's batteries with a view to drawing their fire, and thus disclosing their positions so that they might be successfully attacked by the heavier howitzers.

(d) In expeditions involving the attack of small fortresses, coaling stations, etc., where 5-inch howitzers would be sufficient for the work required.

We see therefore that though under some conditions of siege operations the 5-inch howitzer should be employed on purely Siege Artillery principles, it will very frequently when used by the Siege Train be required for similar purposes as when used with an army in the field.

This explains why it is necesssary to equip the Light Siege Train Batteries in the same manner as the Field Howitzer Batteries, and leads us to conclude *(a)* that the Siege Train would be equally capable of working effectively with an army in the field or in siege operations; *(b)* that as the Field Howitzer Brigade Division is not trained to siege work, its maintenance is an unnecessary expense unless it can be shown that it is likely to be able to do the work required with a Field Army better than the Siege Train could. This brings us to the consideration of (2) but to get a fair comparison we must consider not only the question of *(a)* fire effect but *(b)* facility for tactical employment of these batteries with an army in the field.

(a) It must be remembered that the Siege Train Divisions are composed now entirely of howitzers, and that the training of the Siege Companies is therefore exclusively devoted to these weapons. It may equally well be contended that the training of the Field Howitzer Brigade Division is also confined to the howitzer, and that therefore these batteries are in a similar position; but there is this great difference in the training of the two, that the one is trained under the guidance of the Siege Artillery School at Lydd, which may be said to look at everything from the howitzer point of view, while the other has to look to the Field Artillery School at Okehampton, and must necessarily largely imbibe the ideas that govern the working and employment of field guns. The gun is so different from the howitzer that the same principles cannot guide the employment of both and it may, therefore, I think, be reasonably inferred on *à priori* grounds that the Siege Artillery is better fitted than the Field Artillery for work with howitzers of any description.

If we remember that until quite lately the *gun* was the only weapon of the Field Artillery, and if we consider the great differences as weapons between the gun, and the howitzer I think we might go further and say that the Field Artillery cannot be expected to get full fire effect from howitzers.

The field gun proper is a man-killing weapon, quick-firing (or to be so now) and its flat trajectory allows of some latitude in laying and bursting Shrapnel without wasting ammunition; its chief fire is direct fire and its target must generally be visible over the sights if full effect is to be obtained from rapid fire and accurate laying.

The Field Howitzer has for its projectile a high explosive Common Shell for the destruction principally of material, it is not a quick-firer (nor does it seem desirable that it should be) its fire is curved, and high angle fire, which calls for great accuracy both in laying and ranging if effect is to be obtained, and for the use of concealed positions if full value is to be got out of the Howitzer; the nature of the projectile used demands judgment in determining the most suitable charge to obtain best effects under different conditions.

Now with the training that the Field Artillery Officers get it should not be a matter of surprise, if, when called upon to fight a battery of Howitzers, they should treat the Howitzer not as a Howitzer but as a low velocity gun. This is what has been done.

The only instance up-to-date on which the 5″ Howitzer has been employed on active service is at the Capture of Omdurman last year, when the 37th Field Howitzer Battery took part in the bombardment of that place. From the accounts that are published in Vol. XXVI. R.A.I. "Proceedings," February 1899, it is clear that this battery was fought like an ordinary Field Battery armed with guns, and no attempt was made to take full advantage of the howitzer. The ranges varied from 1200 to 3200 yards, yet the full charge was always used with the result (as seems almost certain) of a large percentage (9 per cent.) of blind shell, for the fuzes used will not act with certainty at low angles of descent. The effect of Lyddite shell depends very greatly on the angle of descent at which they strike, and the best effects are obtained with steep angles of descent; but the greatest angle of descent at any of the ranges with the charge used was about 25°. The recoil of the gun carriages was considerable and gave much trouble; this would have been lessened by using smaller charges. Though the shooting seems to have been excellent and the destructive effects of the projectiles very considerable, it is questionable whether a still better effect would not have been obtained if the howitzer had been used as a howitzer instead of a low velocity gun.

Perhaps it is not altogether fair to bring their case forward as an instance, because the battery was really used in operations that partook of the nature of siege operations, and it may be urged that this criticism is on the howitzers as used in that capacity, and not as they should be used in the field, but it at any rate tends to show that if what are expected to be operations in the field develop into siege operations it is the siege train and not the Field Artillery that should be called upon to use these howitzers.

When we come to consider the question of *(b)* the facility for tactical employment of howitzer batteries we are constrained to admit, that, as for fire effect *à priori* reasons pointed to the Siege Artillery, so now for tactical employment the same reasons indicate the Field Artillery as being the best fitted for the work. But it is not sufficient to dismiss the matter thus, and conclude that the Siege Artillery would not be able to handle these howitzers efficiently in the field, until we have ascertained the principles that should govern the tactical employment of Howitzer Batteries.

To do this we must find answers to these questions :—

(1).—For what purposes should these howitzers be used.

(2).—At what period of an engagement should they be employed.

The *rôle* which the howitzer should play has already been indicated on page 499, and these views are supported by similar ones, put forward in a lecture* before the Aldershot Military Society by Lieut.-Colonel Elmslie, R.A., who is the only officer who has commanded a Howitzer Battery on service, and whose opinions must therefore carry weight. In this paper Lieut.-Colonel Elmslie not only points ont the useful work that howitzers can do in destroying fortified points of tactical importance, in rendering them untenable, and in searching out troops entrenched behind deep cover, but he also draws attention to the fact that the howitzer " is not well fitted to engage an enemy's artilery of the quick-firing type except possibly from behind cover," a condition that he considers " at best can only be quite a disadvantageous position, militating against the development of the full power of the battery owing to difficulty, and uncertainty of observation and consequent slowness of fire."

The inability of the howitzer to hold its own against Field Artillery fire is due :—

To the slower rate of fire which is necessary in the absence of any Q.F. arrangements and on account of the weight of ammunition which has to be carried.

To the fact that the danger zone of Shrapnel is considerably greater than and of a different description to that of Lyddite Common shell, and consequently much greater accuracy of fire is required from the howitzer ; this means other things equal that in a given time a Howitzer Battery could not obtain as many effective hits as a Field Battery and would, therefore run a great risk of being placed *hors de combat.*

Since then Howitzer Batteries should be employed for the specific purposes for which they are intended, and should not as a rule be brought into action against Field Artillery.; we get some indication of when in a battle they will be likely to be required.

As all engagements begin with the Artillery duel and Howiter Batteries are not to be pitted against Field Artillery, it is clear that they are not required at the commencement of an action. The special purposes for which they can be usefully employed are not likely to be clearly indicated until the later periods of the action, and it is not therefore until then that these batteries should be employed. But just as the principles of employment do not call for early action so conditions of expediency prohibit it; for their comparative want of mobility shown by the great weight behind the teams (as compared with Field Artillery) prevent Howitzer Batteries from being moved as rapidly as Field Batteries, or from getting over the same amount of ground in equal times, while the comparatively small number of rounds carried and the difficulty of supplying large quantities of this heavy ammunition prevent any continuous or extensive use of these batteries.

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* Lecture on " The Possible Effects on Tactics of recent improvements in weapons " by Lieut. Colonel F. B. Elmslie, R.A., delivered before the Aldershot Military Society on 6th February, 1803.

The useful employment of Howitzer Batteries being thus by their nature restricted, I think it will be clear that their requisites for tactical employment are, ability to march and the power of moving (comparatively)rapidly for short distances when required to come into action. These batteries do not possess great mobility, and manœuvre is not required from them for they are not asked to come into action against the enemy's artillery, and in line with their own, to advance under fire, and support the infantry attack, or to join in the pursuit, and it seems to me, therefore, that the limited amount of movement which is required is not such as necessarily calls for Field Artillery training and handling, nor more than could be efficiently performed by the Siege Artillery.

The present position of Howitzer Batteries in the British Army is with the Corps Artillery, in this capacity they are going to South Africa, and in this category they must remain as long as they are furnished by the Field Artillery, as there is no other division of the Field Artillery into which they can well be put. But it is clear that they are not intended to perform the *rôle* which is usually assigned to the Corps Artillery, and therefore their inclusion in it is somewhat misleading. The value that is to be attached to a name will appear when we reflect as Prince Hohenlohe has pointed out* that as soon as the "Reserve Artillery" was abolished, and changed into "Corps Artillery" its proper tactical employment was at once recognized, and it is not, therefore, unreasonable to expect that until we find a suitable designation for the Howitzer Batteries employed with a field Army we run some risk of their proper tactical employment being misunderstood. If the course that has been advocated in this paper were adopted and the Field Howitzer Batteries handed over entirely to the Siege Artillery they can suitably be called the "Light Siege Train Unit." This designation will not only truly represent their organisation, for the Light Siege Train Battery, and the Field Howitzer Battery are identical in their equipment, *personnel*, etc., but it will more clearly indicate their proper tactical employment, for the work they are asked to do is peculiar, and is rather Siege work than Field work, and at any rate it will remove any confusion of ideas either as to their employment or proper position in the Army. This suggestion is only a reversion, somewhat modified to be in keeping with modern requirements, to the methods adopted in the Peninsular War which after all was the last great campaign in which the British Army took part, for the Crimean War can be considered little more than a siege. During that war the Duke of Wellington generally kept a portion of his Siege Train two or three days march in rear of the army ready to come up as required, and though walled towns and fortresses such as were then attacked are not now to be found, still every important battle will in effect consist of the Attack or Defence of a carefully selected and prepared position fortified and strengthened by art; such a position will not be attacked without a careful reconnaissance, and examination of it which will take time. The defence of a similar position also requires time to prepare and fortify it. In each case the action is deliberate, in each case Field Howitzers could be usefully employed, but the time available admits of their being there when wanted without necessarily placing thm in such a forward position in the line of march as is usually assigned to the Corps Artillery.

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* "Letters on Artillery"; by Prince Kraft zu Hohenlohe Ingelfingen, p. 141. Translated by Colonel N. L. Walford, R.A. and published by the R.A. Institution, 1887.

To conclude. The contentions that have been put forward in this paper are:—

(1).—That since the Siege Companies are equipped with the 5-inch B.L. Howitzers and are capable of using them effectively under all the conditions of their employment they should be allowed to do so because—

(*a*) The Siege Artillery must use this howitzer in siege work and the conditions of its employment then are often exactly similar to those of its employment in the field.

(*b*) The Siege Artillery are better fitted by their training to get full fire effect from these howitzers.

(*c*) The conditions of tactical employment of Howitzer Batteries only call for the simplest movements in the field which could easily be performed by the Siege Artillery.

(2).—That there is no necessity to employ two different branches of the Artillery with these howitzers, and that the Field Artillery should not be so employed because—

(*a*) The employment of the 5-inch B.L. Howitzer in siege work and in field work must so frequently be under similar conditions that the arm that will be called upon to work it in a siege will equally be able to work it in the field.

(*b*) The general training of the Field Artillery being in the use and employment of *field guns*, prevents them from fully recognising and using the peculiar properties of the howitzer.

(*c*) The special training and aptitude of the Field Artillery in moving and manœuvring is not wanted in handling Howitzer Batteries, and would only be thrown away or even at times perhaps lead to a wrong tactical employment of these batteries.

These are the technical grounds on which it seems to me desirable to give the Field Howitzers exclusively to the Siege Companies and the only objections that I can see that have weight and might be put forward to this proposal are—

(1).—That the present arrangement furnishes a unit ready to hand which only requires augmentation on mobilisation while the plan proposed requires a complete supply of drivers and horses to each Siege Train Company on mobilisation. This is true but the difference is only one of degree. A Field Howitzer Battery requires on mobilisation an addition of 17 drivers and 98 horses, while a Siege Train Battery would require 71 drivers and 156 horses.

(2).—That a Siege Train Company would be at the disadvantage of having officers and men who are wanting in knowledge of horse management, and marching.

This must also be admitted to be at any rate theoretically true; but a similar argument might be employed against the use of mounted infantry, who are not theoretically supposed to know anything about horses, and the short training they do get, would in the case of Siege companies be counter-balanced by the fact that drivers would be supplied with the horses; moreover it is not absolutely necessary to be an officer of a mounted corps in order to know something about horse management.

It is not essential that all guns that are employed in the field should be manned by the Field Artillery. The Mountain Batteries afford an instance of an exception and it is to be hoped that the Howitzer Batteries may too, in course of time, for there would be general advantages obtained from such a step. They are—

(1).—Three Field Batteries will be freed for their legitimate work and then the total number that it is intended to keep up will be sooner made up.

(2).—A larger number of Field Howitzers than at present exist, will be ready at no additional expense, for there will be two Siege Units of 24 howitzers each.

(3).—An increased chance of seeing service will be given to the Garrison Artillery through the Siege Companies; at present their only chance of service is through the Mountain Batteries and how little this helps them will be apparent from a glance at the composition of the force now on its way to South Africa. This is an important consideration as it must affect the popularity and recruiting both of the officers and men for the Garrison Artillery.

(4).—Lastly a definite and satisfactory organisation and specialisation of the Siege Artillery would become possible. Siege Companies at home, and Heavy Batteries in India would be similarly armed and equipped, and by putting them altogether on one list, like the Mountain Artillery, reliefs and supply of drafts could take place among these trained units, thus saving the waste of previous training and expense such as often happens now, with indiscriminate reliefs, and drafts furnished from anywhere and everywhere

It will be observed that the view taken in this paper as to the "normal position" for howitzers in action and that held by Lieut.-Colonel Elmslie and quoted on page 501 of this paper are diametrically opposed. This is interesting as it illustrates well the difference of ideas regarding the method of using howitzers held by the Field and Siege Artillery.

I hope I am not mis-stating Lieut.-Colonel Elmslie's views if I put them thus:—

The *normal position* for Howitzer Batteries in action should be *in the open*, because laying and observation of fire is simple, easy and certain, consequently fire can be carried on rapidly and accurately and so the full power of the Battery can be quickly and readily developed; presumably once this power is developed the Battery can hold its own.

This I call the Field Artillery view and the essence of it is that the howitzer must be treated like a field gun.

The view put forward in this paper is on the contrary that:—

The *normal position* for Howitzer Batteries in action should be a *concealed one*, because howitzers are not able from the nature of the fire or projectiles used to defend themselves from attack; if concealed, their position will not be discovered and they will, therefore, be free from attack. Laying and ranging can be carried on quite easily, though there may be a little delay in opening fire and in getting the range owing to the different method of laying that must be adopted and to the probability that the first few shots will be considerably wide of their mark, but as the position is not disclosed even when fire is opened a slight delay in doing so will not be of much importance; after the first few rounds laying and ranging will be just as easy, regular and rapid as in the open, but immunity from the enemy's fire having been obtained by the concealed position the full power of the Battery can be readily developed without let or hindrance.

This may be taken as the Siege Artillery view, and the essence of it is that the howitzer must not be treated as a gun.

It is only fair to point out that in his lecture Lieut.-Colonel Elmslie does not lose sight of the use of concealed positions for howitzers, though it seems to me that he is a little unwilling to realise their true value.

DEDUCTIONS
FROM SOME
FIELD ARTILLERY PRACTICE.

BY

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THE whole of this paper is based on the analysis of old practice reports. There is no theory in it. The general conclusions, depending on some 5000 rounds of 12-pr. B.L. Shrapnel *with head burster*, are placed first. Afterwards are given some details and diagrams illustrating the manner of analysis. It is well at once to remark that there is no certainty about the deductions. They are merely probably true as far as the number of rounds analysed is capable of disclosing the truth, and as long as the general conditions under which practice takes place remain practically unaltered.

DEDUCTION: Never try for the possible maximum.

Perhaps the most important deduction is this: that, just as in tactics, the best is the enemy of the good, so in shooting is the possible maximum the enemy of the average maximum. Take for instance the length of fuze. Because an apparent possible maximum has been produced in a given series with a burst short of 20 yards, we have no right to conclude that that is the best average burst short. On that particular occasion the elevation may happen to have been exactly determined, and the whole shooting has, perhaps, been abnormally good. To arrive at the true state of the case, we must group all series with mean bursts short of 20 yards under one heading and compare the average effect then obtained with that resulting from other series with other distances of bursts short. We then arrive at the best average burst short which differs from the best possible. The variation is due no doubt to certain errors, errors in the final elevation ordered, errors in the laying observation and fuze-setting, but those errors are part and parcel of the shooting and will probably always remain so. Instead of the fuze, let us consider the elevation. We should of course expect a maximum possible effect when the range was exactly determined, but the best *average* result is found from the analysis to be when the elevation is low by an amount depending, as before, on the various errors inseparable from practice. To recommend that the best course for a Battery Commander to pursue is to try to order the exact elevation or that length of fuze that has been found to give a maximum effect under artificial experimental conditions, is to leave out of account the various shooting errors and so to mislead him in his true object, which is to endeavour to obtain the maximum average effect. To pick out from one's old practice reports the best results, and on them alone to base one's corrections when shooting, is vanity. The bad should be taken with the good. It is the expectation of too much that leads to vexation—to occasional possibles, but to bad averages.

Rule for fuze length for best average effect.

To return to the fuze. Whether the fuze-setting is good or bad, the best average burst short will usually nearly settle itself if the rough and ready rule below is complied with. Consider as " lows " all shell, any portion of whose bursts are below the top of the target. Consider all other shell as "highs." Reckon in twice over all " lows " that are beyond the target. The proportion of " lows " to " highs " should then be as follows :—

At yards.	" Highs "	" Lows."	Remarks.
1,000	1	1	" Lows " are all shell any portion of whose bursts are below the top of the target. " Highs " are all other shell. "+ Lows " are to be counted twice.
2,000	2	1	
3,000	3	1	
4,000	4	1	

The above is easily remembered and fairly easily applied. If the " highs " (or " lows ") are more than twice as many as tabulated, the fuze should be lengthened (or shortened). Within these limits it is well to be satisfied : the best is the enemy of the good.

The table is intended for use when the score is counted by " men hit." When hits alone are counted, there should be only half as many " highs " as the table gives. The length of burst short that the rule produces depends on the height and distance of the target and on the various errors of shooting, but it will usually turn out to be from 40 to 120 yards. The better the laying and fuze-setting, the nearer will the mean burst approach. As far as I have been able to test it, the rule seems to apply for the 15-pr. and 12-pr. with base bursters as well as for the old 12-pr. with head burster, a result that was certainly not expected, but it must be borne in mind that much besides the angle of opening of the shell has changed with the newer equipments and that the rule is a rough and ready one. The table shews that, when there is any doubt, the fuze for battery fire should first be ordered too long, for a few rounds will then probably bring about a correction ; whereas, if it is ordered too short, it very likely that a large number of rounds will be fired and observed before the error can be discovered by the proportion of " highs " to " lows " being upset. Exceptions to the above are, first when there is no time for any correction, and secondly when the proportion of " highs " to " lows " is even, or nearly even, that is, at short ranges. The choice of too long a fuze for battery fire at first commencing it, may also help in the verification of the elevation.

Rule for Elevation for best average effect.

The maximum average effect is produced, not when the elevation is correct, but when it is too low, so, when selecting the elevation for effect, if the +’s exceed the —’s, drop the elevation; but do not raise it, if the reverse is the case, unless the —’s exceed the +’s by over two to one. That the elevation ought on the average to be too low is due to the rapid diminution in effect when the elevation is too high. See for instance (Fig. II.).

In applying this rule for corrections of 25 or of 50 yards, (it will not work for larger corrections) signs should be reckoned in at the contemplated elevation as well as at the elevation at which the shooting is taking place.

For instance supposing we had—

1900
— 2000
1950 +
—

supposing also that the time had come to shoot for effect and we selected 1950 for our elevation. If we then had two more —’s at 1950, the —’s at 1950 and at 2000 (the assumed contemplated correction) would exceed the +’s at these two elevations by over two to one and we should correct to 2000 yards.

Again, suppose instead of the above we had

1900 2000
— 1950 +
= 2000
+

and we selected 1975 for our elevation. If at this range we had 3 +’s, the +’s at 1975 and at 1950 would exceed the —’s at those two elevations and we should correct to 1950. But if we had 3 —’s at 1975 we should not correct to 2000, for it requires 5 —’s at 1975 and at 2000, before the —’s at those two elevations exceed the +’s by over two to one. In fact in applying the rule we look upon two contiguous elevations as one elevation.

Perhaps one other case will make this matter quite clear. Suppose we had:—

1900
— 2000
1950 +
— 1975
±

it would require two more +’s at 1975 to make the +’s at 1975 and at 1950 greater than the —’s at those two elevations. That is two +’s would be required before correcting from 1975 to 1950. On the other hand it would require four more —’s at 1975 to make the proportion of —’s at 1975 and at 2000 exceed the +’s at those two elevations by over two to one. That is 4 —’s would be required before correcting from 1975 to 2000. The compliance with the rule thus tends to keep the elevation low. That is the object in view.

The question of the time at which it is desirable to cease ordinary ranging and to begin to shoot for effect is dealt with under the head of verification later on.

Other hints for elevation.

When firing time Shrapnel for effect there should be no "+ grazes" and very few "+ lows." For this reason, in corrections of elevation during time Shrapnel fire "+ lows" should be noted as ‡ (two +'s). Thus, in the last example, although two + percussion shell would be required at 1975, before a correction was made to 1950, one "+ low" would bring about that result.

"Lows" should never be noted as − unless they burst on the bottom line of the target or below it.

Hits whether from percussion or Time Shrapnel, may be noted as $\left.\begin{array}{c}\pm\\ \pm\end{array}\right|$

Ricochet hits and hits on cover behind which troops are posted as $\begin{array}{c}\underline{\underline{+}}\\ \underline{\underline{+}}\end{array}$

The reason is, hits are seldom misobserved. Effect from Time Shrapnel may be noted as ± and as "high-low." The observation of effect is very important. By far the most satisfactory and comforting verification is effect, but at long ranges, a well-trained assistant using a telescope is required to observe it. When firing fast, say at about 10 rounds a minute, unless there is a good deal of wind, some portion of the target should usually be obscured by the smoke of the bursters, even at 4000 yards. If then the target appears almost always quite clear, either the fuze is short or the elevation long. Dropping the latter will seldom do harm; though it may do no good, there is often no time for any other correction. Some French regulations prescribed, I believe, a rapid rate of fire in order to verify by commotion amongst the enemy. If there was no disturbance or trouble, it was known that either the elevation or fuze was wrong. In any case there can be no doubt that every opportunity should be taken to observe effect, for it can hardly be misobserved and the bugbear of shooting is the misobservation of +'s and —'s. It is very common to wait, especially when firing against artillery for the smoke to drift past a hostile gun in order to observe a round. That is always dangerous. Observation should be instantaneous. Fewer rounds will be wasted by repeating till one round pitches in line, than by one round misobserved owing to the drift of the smoke.

The analyses all show that corrections of elevation and fuze were very seldom attempted during battery fire, although it must often have been quite clear to the Battery Commander that such corrections were necessary. It is very probable that they realised there was no time and it is suggested that some such order as "From No. 3, 2000 yards" should be held to mean that the order was to be taken up by guns in succession, without any disturbance in the interval or rotation of fire.

And similarly as regards a change of fuze. If the Battery Commander named the gun that had just fired in the case of a correction of elevation, the gun that had just loaded in the case of a correction of fuze, there should be no fire pauses.

Verification. It is with much less confidence that verification is dealt with. The analyses seem to show that, when shooting against time, there was sometimes too much verification, occasionally so much, that there was no time left for effect. But, on the other hand, they also show that, when the score was by effect per shell, verification was insufficient.

The degree of verification that will give the best average effect, seems to be three times as much when the effect is judged per shell, as when it is judged per minute. It seems to vary inversely as the root of the range, directly as the time or as the ammunition still remaining for effect.

A formula is given below, also a table, but I must confess they are next door to pure speculation, the analyses being far too few for any reliable deductions.

The formula for *time* effect is—

$$Sh = \frac{30v}{\sqrt{R}}$$

for effect *per shell*, it becomes—

$$Sh = \frac{10v}{\sqrt{R}}$$

Where

Sh = The number of Time Shrapnel that should be fired for effect.
R = The range in thousands of yards.
V = The degree of verification that will give the best average effect. This quantity is measured by the least number of rounds of the same sign (+ or −) within 51 yards of the most likely elevation.

Thus supposing we had

2000 yards	2100 yards
−	+

the most likely elevation would be 2050 yards and V would equal 1

In such a case, for *time* effect, $Sh = \frac{30 \times 1}{\sqrt{2}} = 21$; that is to say that, if the firing is at 6 rounds a minute and we had $\frac{21}{6} = 3.5$ minutes left, the formula tells us we may accept the 100 yards bracket as sufficient verification. But, if we were shooting for effect per shell,

$$Sh = \frac{10 \times 1}{\sqrt{2}} = 7 \text{ only}$$

and we see that, by the formula, we have only sufficient verification for seven Time Shrapnel. In both cases, as already explained, the elevation selected for effect would be 2000 yards.

If, when firing for effect per *shell*, we know that after ranging we are to fire 21 Time Shrapnel at 2000 yards, we have

$$Sh = 21 = \frac{10v}{\sqrt{2}} \therefore v = 3$$

That is to say we ought to have some such pattern as this with our percussion Shrapnel:—

2000	2025	2050	2075	2100
—				
				+
		—		
		—		
				+
			+	

where there are 3 —'s within 51 yards of the elevation 2050, and also 3 +'s within the same distance of the same elevation.

As special cases, *V* for the 200 yards bracket may be considered equal ½, *V* for the first 50 yards bracket as 1½.

Thus supposing we had a 200 yards bracket at about 1000 yards range, we should have

$$\text{(for time effect)} \qquad Sh = \frac{30 \times \frac{1}{2}}{1} = 15$$

$$\text{(for effect per shell)}\ Sh = \frac{10 \times \frac{1}{2}}{1} = 5$$

For Time Effect.

V	1000 yards.	2000 yards	3000 yards.	4000 yards.
½	15 Rounds.	10 Rounds.	9 Rounds.	7 Rounds.
1	30 ,,	21 ,,	17 ,,	15 ,,
1½	45 ,,	32 ,,	26 ,,	22 ,,
2	60 ,,	42 ,,	35 ,,	30 ,,
3	90 ,,	64 ,,	52 ,,	45 ,,
4	120 ,,	85 ,,	69 ,,	60 ,,
5	150 ,,	106 ,,	86 ,,	75 ,,

The above table allows for ordinary misobservation. But when misobservation is 50% and there is no range-finder, the only course, if ordered to fire, is to do so in the general direction of the target without any ranging or verification at all. Similarly the analyses appear to show that, if the range is measured once and if the misobservation is likely to be 30%, it is best to trust entirely to the range-taking. The average range-taking error is about 3%. Should it be much less or much more, the above remarks must be modified. Every time the range can be measured to different parts of the target by different observers, is as distinct a gain as is an extra 200 yards bracket, or somewhere thereabouts at medium ranges, provided always that corrections for weather, powder and displacement are not entirely lost sight of. If these points are really carefully attended to, the instrument has a higher value.

The table given above for verification shows that, when the allowance of time or of ammunition is very limited, one round may change the value of *V* by 100%. To keep exactly to what the table prescribes is therefore clearly impossible at practice. That, however, is a matter of little moment, for, first the table is very rough, secondly there are almost always two values of *V* that give equal results and thirdly there are a thousand circumstances, that the formula takes no account of, that may tend to modify the degree of verification desirable. It seems that more verification is required when the score is counted by "hits" than by "men hit" when the shooting takes place under average conditions, but the whole subject of verification is very obscure and the statistics at my disposal are insufficient to clear it up.

Suggested rule for score.

The practice analysed tends to show that "hits" are a better measure of a battery's all round accuracy than "men hit," unless the targets and conditions are such that the best battery can only hit about half the men. It seems that a good rule would be—

$$\frac{\text{hits} \times \text{men hit} \times \text{front of target}}{\text{rounds} \times \text{minutes} \times \text{area of target.}}$$

"Men hit" must be taken into account, for counting hits alone would not encourage good distribution. "Rounds" being in the denominator would prevent waste of ammunition. There need be no fear that counting them in would produce too deliberate a rate of fire, provided the time allowed was on the average short. Such a formula as the above might possibly work fairly well for appliances such as are used at Okehampton for moving targets, magazine fire and case.

Almost any method of counting hits is to be preferred to the estimating of so-called "effective" shell.

In the formula "hits" are included in the numerator. If it is desired to limit the number of hits to be counted on any single dummy, I would suggest the limit being fixed by the total number of rounds fired and not by any arbitrary number. The analyses do not however show that there need be any such limit. It is unnecessary to add it is impossible to conceive any formula that will eliminate luck. The front and area of the target have been included in the formula in order to make some allowance for the nature of the target.

The method of analysis explained with examples.

Some of the practice analysed will now be given. Each of the curves has been drawn independently and no attempt has been made to reconcile one with another or any of them with theory. Apparent discrepancies may be accounted for by faulty analysis. I hope however they are due to the number of rounds analysed being too few to bring about exact concordance and to its being extremely difficult to realise the combined effect of shooting errors by any theoretical methods. The curves have been modified from time to time as fresh data have come to hand and fresh experience has been gained. If, as is most probable, they are all still very far from representing the truth, yet they probably approach it more nearly than any deductions that can be made from the practice records of any single battery.

Figs. (I) to (XI.) inclusive have been deduced from 42 series each of 24 rounds fired at various stations. Target, 3 groups each of 15 standing dummies spaced at 2 yards, the groups being spaced at 25 yards. Total front therefore 140 yards. Range about 2000 yards and known beforehand to about ± 200 yards. Gun 12-pr. with Shrapnel with *head* burster. Average number of Percussion Shrapnel for ranging 6½. Average number of Time Shrapnel for effect 17½.

Fig I. shews that "hits" are only approximately in proportion to "men hit," when the latter are half, or less than half, of the total number of men in the target.

100 hits kill about 30 men, 600 hits no more! but it must be remarked that the trace of the curve above 300 hits is very uncertain. The dip of the curve beyond 300 hits illustrates bad distribution, very possibly due to too long a fuze. The fact that the curve of "men hit" is parallel to the line of hits from 200 to 400 hits shows, that unless "hits" were mere luck, "men hit" would be no measure of a battery's efficiency. But the diagrams that follow will show that "hits" are a measure and a very fairly good measure of accuracy. It follows then that "men hit" is not a measure of a battery's shooting under the conditions for which the curve has been drawn. Had there been say 3 or 4 times as many men in the target, or say only half the number of rounds fired, then perhaps to have reckoned the score by ' men hit" alone would have been fair enough.

Fig. II. shews—

(a) That the maximum average effect was produced, not when the elevation was exactly determined, but when it was about 12½ yds. too low.

(b) That good effect was obtained when it was from 18 yards too high to 3 × 18 yards too low. (The average mean error in determining the elevation was 18 yards).

(c) That hits are a much more pronounced measure of accuracy in ranging than men hit, for an error of – 100 yards reduces the hits by 60%, but the "men hit" by only 40% or thereabouts.

Fig. III. shews—

(a) The importance of good laying, for the drop of both the curves "men hit" and "hits" is very marked as the error in laying increases.

(b) That "hits" are a slightly more pronounced measure of accuracy than "men hit," for an increase of the error from 20 to 40 yards decreases the effect in "men hit" by only 25%, while it lowers the "hits" by 33% or thereabouts. (The average mean error in laying was 25 yards. The term laying error as here used includes the guns' errors).

Fig. IV. shews—

(a) The importance of good fuzes well set. A change in the fuze error of from 30 to 60 yards reduces "men hit" by 25% and "hits" by about 33%.

(b) That "hits" are a more pronounced measure of accuracy than "men hit" as far as fuze-setting is concerned. (The mean fuze error was 35 yards).

Fig. V. shews that the Battery Commander cannot range unless the laying is good. An increase in the laying error of from 15 to 30 yards increased the error in the final elevation ordered from 9 yds. to 25 yds.

It seems clear that when laying is bad, minor corrections of elevation are not worth while, at any rate during ranging, for the dispersion of shell will cover such a lot of ground; such corrections may however serve to modify the fuze so as to give the proper proportion of "highs" to "lows" whenever battery fire is protracted. (The mean average laying error was 25 yards. Misobservation was only 2% and its effect was inappreciable).

Fig. VI. shews that the best average effect was when there were at least 3 or 4 +'s and 3 or 4 −'s within 51 yards of the final elevation ordered. As the average was rather under 2 of each sign we conclude that verification was underdone. It is to be noted however that the drill of the batteries may not have allowed the time necessary for sufficient verification. The figure seems also to show that there is latitude in verification. Beyond 2 of each sign (+ and −) the curve rises very slowly, beyond 3, hardly at all.

Fig. VII. shews how the error in the final elevaion decreased with verification, but how slowly it fell after the verificaion passed two of each sign (+ and −), thus confirming Fig. VI. Beyond 3 the curve nearly parallel to the base line and it is clearly seen there must be some upper limit to the verification that pays best.

Fig. VIII. shows—

(a) That the best average burst short for "hits" was 40 yards; for "men hit" 80 yards. With the head burster this latter distance was quite unexpected. We have seen that the laying mean error was 25 yards, that fuze mean error was 35 yards; the combined mean error was therefore

$$\sqrt{25^2 + 35^2} = 43 \text{ yards.}$$

(b) The comparatively rapid loss when the bursts are over; 50 yards over seems as bad as 200 yards short.

(c) That "hits" are a more pronounced measure of accuracy in determining the correct length of fuze than "men hit." At 80 yards burst short 40 men are hit, at 160 yards 32. At 40 yards burst short there are 240 hits, at 120 yards 140. In the first case the loss is 20%, in the second 42%.

(d) That, with the same elevation, two fuze lengths give the same number of "men hit," viz., the one giving a burst short of 55 yards and the other a burst short of 105 yards. Fig II. shows very good effect produced with an elevation of from 10 yards too high to 50 yards too short. Altogether, therefore, what with tolerations of burst short and of elevation there is a considerable margin for effect, and probably a number of combinations of fuze and elevation producing the same effect.

In calculating the positions of the mean bursts short, the same number of high shell have been cut out as there were grazes. Had this not been done, the best average short would appear even further back.

Fig. IX. shows:—

(a) That there should usually be grazes during Time Shrapnel fire.

(b) That the best average proportion of grazes was 9% for "men hit."

(c) That from 0% to 25% on graze gives good results for scoring "men hit."

(d) That from 4% to 40% gives good effect for "hits."

(e) That there may be good effect without any grazes, that, consequently, it is not always possible to base corrections of fuze on the proportions of "Airs" to "Grazes." This is why recourse must be had to the proportion of "highs" to "lows," for the actual heights of burst can seldom be correctly estimated. The judging of "lows" of course introduces a personal error, but not, I think, a very variable one.

Fig. X. shows:—

(a) That there should be no + grazes for the best average effect.

(b) That for good effect there should be few. This is why recourse must be had to "+ lows" (which are at any rate more numerous than + grazes) when we wish to correct our elevation during Time Shrapnel fire.

(c) That to count in time with percussion Shrapnel grazes when analysing, will bring out too high a gun-range. This is evident, for there should be no + grazes.

(d) How difficult it must be to range with Time Shrapnel by trying to preserve the proper proportion of + to − grazes, or even + "lows" to − grazes, and how careful it is necessary to be before making corrections of elevation upwards during Time Shrapnel fire. Only about 10% should be + grazes even with a total of 50% on graze. This proportion varies, but not directly, with the total percentage on graze. The moral seems to be, adequate verification before Time Shrapnel. But all this can only be seen from many such figures as Fig. X.

Fig. XI. shows that "men hit" are a much less pronounced measure of general accuracy than "hits." As "hits" alone would leave distribution out of account; a curve of "hits" × "men hit" has been drawn. Though it is not in direct proportion to accuracy, it measures it very fairly. If the target is larger or the number of rounds fewer, Fig. I has shown us that the measure would be a good deal fairer. In any case all the figures have shewn that "hits" are a better measure than "men hit"; it seems unwise therefore not to reckon in both for score.

Fig. XII. is similar to Fig. VI. but about three times as many rounds have been taken into account. About 32 rounds per series were fired at different targets. The conclusions are the same as those drawn from Fig. VI.

Fig. XIII. shows:—

(a) How important it is to reject any round about whose observation there is the least doubt. One round misobserved in five would seem to reduce the effect by 50%. We have already seen that several extra verifying rounds would not seem to entail any very evil results, the repetition of doubtful rounds is therefore emphasised.

(b) How the range-finding seems to have influenced the result when observation was bad is seen by the very fair effect when 40% to 50% were misobserved.

(c) That the loss in effect due to misobservation is serious: the

figure shows the effect at 12½% to that at 0% misobserved to be as 6 to 9.5. That is with 12½% misobserved there is a loss in effect of 37% ! (12½% were actually misobserved).

The figure has been drawn from 40 series of 38 rounds of which 7 were ranging rounds. Average range about 2400 yards. Stations various. Range measured with a mean error of ± 70 yards. Target, infantry in fours. The curve is very doubtful towards 40% and 50%.

The first eleven figures again.

In the 42 series, Figs. I. to XI., the probable fuze error due to weather and various "thousands" was almost exactly ¼. According to this, the correct fuze may possibly vary 10% ; thus the great importance of having fuzes of one number of thousand and knowing them well, or of having a mechanical fuze, is easily realised. The necessity of noting the weather and the information on the fuze-tin's lid is also clear. Even with a mechanical fuze some error will remain.

The curves generally and misobservation in particular.

That the changes of each effect-curve as it passed through or neared the maximum or minimum should be slow was expected, but that they should be as slow as the curves disclose came to me as a surprise. Yet the fact is easily accounted for. When we consider theoretically the effect for instance of bad fuze setting we are apt to leave the other errors out of account, but all errors come into play when we actually shoot. Thus all the curves get flatter or spread themselves out further than we might at first suppose.Each error is bad, but none is quite as black as sometimes painted. Misobservation is by far the worst. It is so serious that it seems desirable that the observer should be a specially paid and trained specialist, whose only duty in action was observation and who could use a telescope as well as a naval signalman can. Von Rohne's estimate of misobservation is 10%. That amount would appear to result in a loss in hits of about 30% ! I have too few practice reports of the last few years to enable me to fix the English percentage now misobserved. But, if it reaches Von Rohne's estimate, the advent of specialist observers is as sure as that of Christmas.

My analyses show misobservation to be only about 7%, but most of the practice took place under easy conditions.

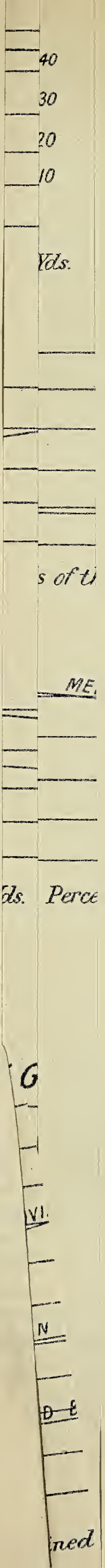
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FIG. I.

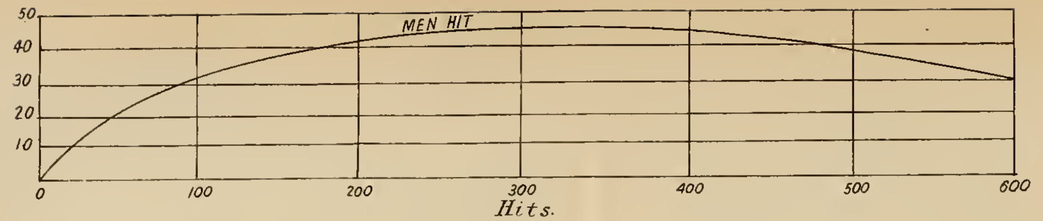


FIG. II.

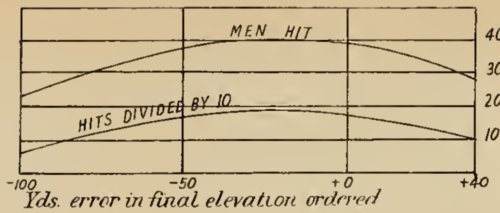


FIG. III.

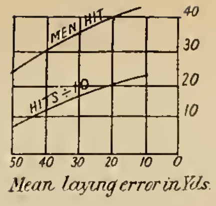


FIG. IV.

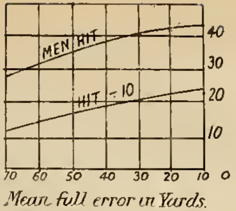


FIG. V.

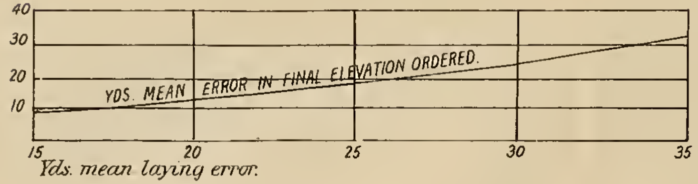


FIG. VI.

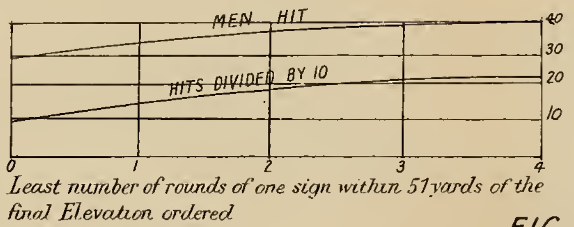


FIG. VII.

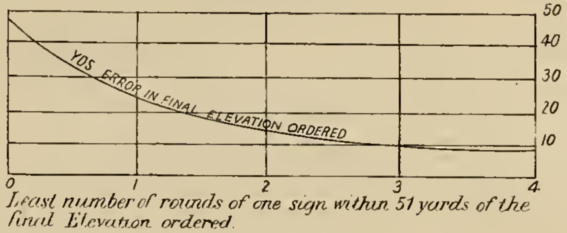


FIG. VIII.

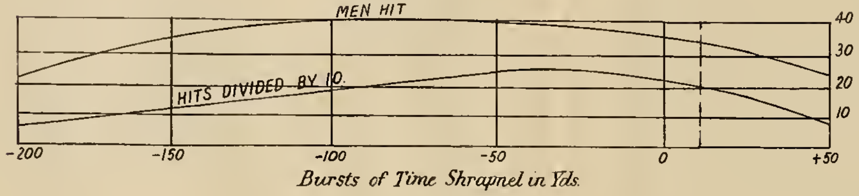


FIG. IX.

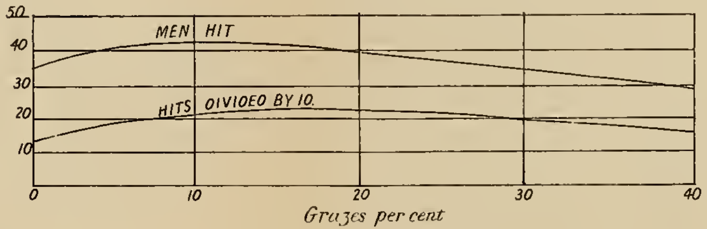


FIG. X.

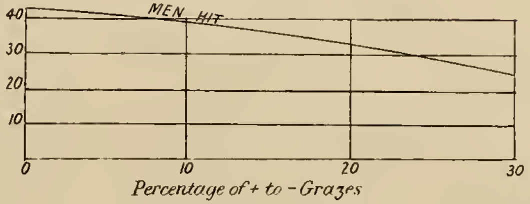


FIG. XI.

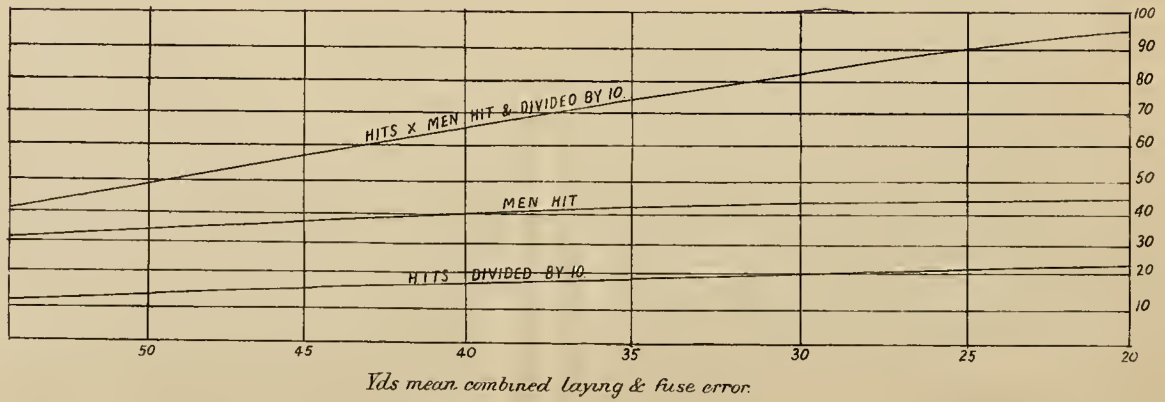


FIG. XII.

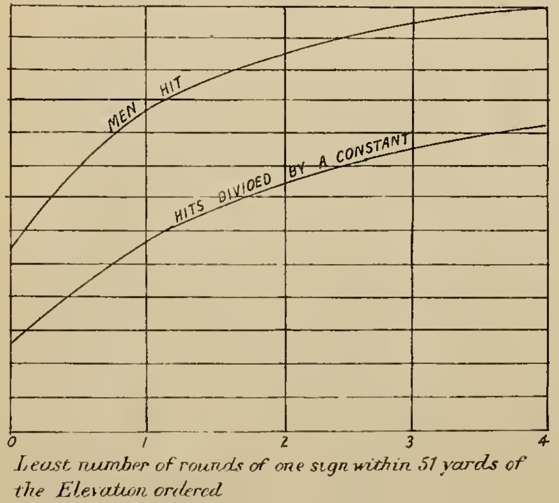
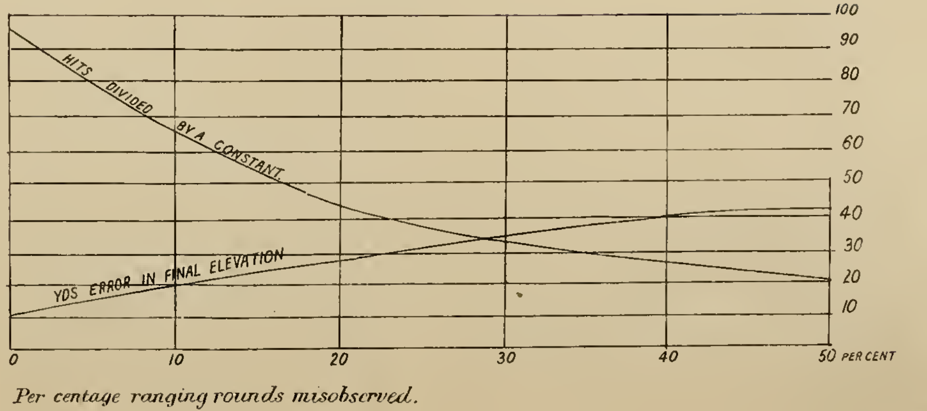


FIG. XIII.



WITH THE INTERNATIONAL FIELD FORCE IN CRETE, 1897

BY

MAJOR H. C. C. D. SIMPSON, R.A

(A Lecture delivered at the Royal Artillery Institution, Woolwich, Thursday, 2nd March, 1899.)

Major-General J. F. Maurice, c.b. R.A., in the Chair.

GENERAL MAURICE, Officers and Gentlemen:—After the recent lectures in this Institution on the stirring incidents of the Soudan Campaign, I feel great diffidence in appearing before you today to recount my experiences with the International Forces in Crete, as the long and monotonous occupation was not varied by any continuous series of operations, nor marked by any circumstance of other than local interest. To many officers of this force, the political and naval, rather than the military aspect of the situation, was the most interesting. But these will not form the subject of my discussion today, as the political circumstances have been freely detailed in the newspapers, and the naval operations in the February number of the "United Service Magazine." I may however perhaps be allowed to state that our country played the most important rôle,—the first violin of the European concert. By making ourselves responsible for Candia the centre of Cretan Mahommedism, our troops had the most difficult task assigned to them, and it was by events at that town last September, that a rapid solution of the Cretan problem was arrived at, though alas over the dead bodies of our brave soldiers and sailors.

For years Crete had been the hot-bed of insurrections and disturbances, but the immediate events which led to the military occupation of Crete by the Powers are doubtless well known to you. They followed in quick succession in the first 2½ months of 1897. Massacres of the Christians by Moslems at Candia and elsewhere, had been followed by the same occurrences at Sitia, where the Christians retaliated on the Moslems. The Gendarmery revolted at Canea, the capital of the Island, and the greater part of that town was burnt. The Admirals of the six great Powers, Russia, France, Germany, Austria, Italy and ourselves, accordingly assumed the general direction of affairs, but Greek troops were unfortunately permitted to land in the Island. The population in Crete was about 300,000 of whom ⅔ were Christians These latter encouraged by the presence of the troops from Greece, with which country they clamoured for union, made attacks upon the various Moslem positions, under the command of the guns of the Fleet, which on one occasion had to open fire to cover the retirement of the Turkish troops from the Malaxa Redoubt, behind Suda.

The Admirals soon decided to assemble all the Moslems from the outlying districts in the principle maritime towns, together with the Turkish troops, and to limit the direction of affairs by the Turkish authorities to government of the people in these towns. They were Canea the capital, Candia the old capital, containing half the Moslem population of the Island, and one of the strongest old fortified towns in the world, Retimo, Sitia, Spinalonga, Herapetra and Kisamo Kastéli. It was determined to occupy these towns with International troops, and to establish a blockade of the Island. 600 infantry were asked for from each Power. All complied with the exception of Germany, who landed 16 marines. The first batch of troops landed about 26th March, and in our case consisted of 6 companies of the Seaforth Highlanders, 2 for Canea which was to be the head-quarters of all the contingents, and the remainder for Candia, which Great Britain had consented to take over as her sphere of influence. At this latter place, the reception was most unfriendly, and tact was required to prevent a collision with the natives.

Outposts were established outside the towns, inside which the Christian insurgents in arms were not allowed. It soon became evident, however, that the number of International troops originally demanded was insufficient. The relief of Kandanos, by British and foreign seamen and marines, with a half battery of 7-prs. carried on pack animals, worked by the blue jackets, had been carried out with great difficulty, so 600 more infantry and a half mountain battery from each Power were asked for by the Admirals. Austria and Germany refused to comply. France offered to send 300 more Infantry of the Marine and to keep 300 men and a mountain battery in reserve at Toulon, for employment in great emergency. Russia, Italy and ourselves agreed to send each a mountain battery and 600 more infantry.

On the 1st April, 1897, No. 4 Mountain Battery received telegraphic orders to complete its equipment to war establishment, and with strength 5 officers, 179 N.-C.-O's and men, 38 mules, 6 officers horses, and 6 guns prepare for embarkation for Malta on the 10th; all mules or horses unfit for active service to be left at Newport, and the battery completed in this respect at Malta. It was not considered necessary to incur the expense of taking out horses for the mounted men, as the Artillery duties in Crete were to be limited to moving out by day to the outposts on the hills behind the maritime towns in Crete, which would involve only a march of about eight miles, and to return again in the evening to our encampment in the town. As I considered our horses unsuited for service with the battery in a mountainous country, I obtained permission to leave the whole of the horses behind and to replace them by cobs at Malta. I mounted the necessary mounted men on riding mules, which I obtained on loan later on from the Army Service Corps in Crete. I may add here that this was the first occasion in our history in which a mountain battery organized as such in peace, had been ordered on active service from the United Kingdom, and the first time for forty years, that British troops had been called upon to act in alliance with those of Foreign Powers.

We sailed on the evening of the 10th in the P. and O. S.S. *Sumatra* in company with the Suffolk Regiment, going out to Malta to replace the half battalion of the Royal Welsh Fusiliers and the 1st Battalion Seaforth Highlanders, which either had proceeded or were proceeding to Crete forthwith. We had a very rough passage out, and had to lay to for several hours in the Bay, and subsequently in the Gulf of Lyons, losing two infantry horses, and two mules from the severe weather. We arrived at Malta on the 19th, when we were informed that we were to go on in 4 days to Crete, and that a telegram had been sent to the Committee of Admirals administering the International fleets and troops, enquiring as to the town at which we were to disembark. On the 23rd, having obtained the necessary mules and ponies, and replaced one or two casualties amongst the men, we embarked in an old Cunarder of about 1800 tons, the *Samaria*, which was going to Crete to act as a condensing ship, for the supply of water to the troops. The water supply of the towns was apparently entirely controlled by the hostile Christian Insurgents, who encouraged by the presence of the Greek troops, under Colonel Vassos, appeared to be practically investing the three principal towns, Canea, Candia, and Retymo. After another indifferent passage, during which we had all to be vaccinated owing to the presence of smallpox in the towns of Crete, we arrived at daybreak 26th April off Candia. The Naval Transport Officer and Staff Officer of the troops came on board, and informed us we were to disembark all the battery except the mules, for which no arrangement had been completed as to the ground on which they were to be encamped, it having to be purchased from the Turkish authorities. Our camping ground for the men and officers were indicated as on the top of the parapet on the western side of the town, and had been levelled for us by a detachment of the Seaforth Highlanders, between whom and the Royal Welsh Fusiliers we were eventually to be encamped for seven months, the men confined to a piece of ground about 1000 yards by 25 yards, and under the provisions of those clauses of the Army Act applicable to active service.

The Battery had to be transferred to lighters in the road-stead, which were towed by steam launches to the quay in the harbour, and as we had a very large amount of equipment and baggage, this took some considerable amount of time. Able assistance was, however, rendered us by the blue jackets of H.M.S. *Camperdown* and *Trafalgar*, which were at anchor in the roadstead. Later in the day, intimation was received that as on two days out of every three a heavy sea was running rendering the disembarkation of animals in the roadstead a difficult and risky operation, the mules and cobs would have to be landed that afternoon. It was fortunate this decision was arrived at, as for the three days following, a gale of wind was blowing, and all communication between the ships and the shore was interrupted. It was 9 o'clock at night before the whole of the Battery was in camp and after the mules had been picketted, watered and fed, officers and men were entertained by the half battalion Royal Welsh Fusiliers. between whose camp and that of the 2nd Seaforths, our own was wedged. On the Sunday previous to our arrival, there had been a sharp fight between the Bashi-Bazouks of Candia and the Insurgents from Pelio-Kastron, at Almyro on the coast about 7 miles west of the town, in which the latter had apparently got the best of it. It was rumoured also that Colonel Vassos with his Greek troops of 1500 infantry and two Mountain Batteries, had determined in concert with the Insurgents, to attack the outposts of Candia, the principal Moslem town. He apparently thought better of it, and remained throughout his stay in Crete, with his troops at Alikianu, a few miles west of Canea.

On our arrival in Crete the distribution of the International troops was approximately as follows. At Canea the seat of the provisional administration of the Admirals, were quartered from 250 to 300 men of the infantry of each Power, about 1200 men only, as Germany was represented on shore by only a small party of blue jackets under a petty officer. The Italian Mountain Battery was also stationed here, and the whole of the troops were under the command of Captain Amoretti of the Italian Navy. At Candia under the command of Colonel Chermside were half Battalion Royal Welsh Fusiliers, the 2nd Battalion Seaforth Highlanders—less the Canea detachment—the British Mountain Battery, and a Battalion of Italian infantry from Naples. At Retymo, the headquarters of the Russian sphere of influence, under Colonel Schustock, were one-and-a-half Battalions of Russian infantry from Odessa, some Montenegrin Gendarmery and the Russian Mountain Battery. At Sitia and Spinalonga in the Eastern Province were the French Marine Infantry, about 600 strong. The French Mountain Battery was to have been quartered here, but never proceeded further from Grasse, their head-quarters, than Toulon, where they were held ready for embarkation for months. At Herapetra were a half Battalion Italian Bersaglieri, and at Kisamo, a detachment of Austrian infantry, later on withdrawn to Suda, which they garrisioned. Total strength of International troops, 5,000 infantry and three batteries.

On the outskirts of each town on the land side, an earth-work was selected, on which flew the flags of all those Powers, whose troops formed part of the garrison, under an International guard. The Turkish flag was also hoisted in the Redoubts, as also at different points in the towns. At present only one of these Turkish flags remains hoisted, viz. on the island at the entrance to Suda Bay, the new Cretan flag, a blue ground with white St. Andrew's Cross, and a white star on a red ground in left hand top corner, having taken its place elsewhere throughout Crete.

The strength of the Turkish force in the island at the commencement of the occupation was about 10,000 and consisted of 14 battalions of infantry, 3 Mountain Batteries, 1 troop of cavalry and some Fortress Artillery, who manned the one or two 6-inch B.L. guns and some obsolete muzzle-loaders, about 24-prs., mounted on the sea fronts and in the International Redoubts of the principal towns. Nearly every male member of the population carried a rifle, and at Candia, where the Arsenal had been looted shortly before our arrival, by the Moslem mob , every Bashi-Bazouk (Cretan Irregular) was armed with a Martini-Henry carbine. The British troops were mostly encamped in "European Privates" pattern tents, the officers, 2 in a "Staff-sergeants" tent, except O.C's who had a tent to themselves. The other International troops and the Turkish troops not on outpost duty, were quartered in barracks or other public buildings. Except at Candia, where it was thought advisable for political reasons to garrison them with Turkish troops, the outposts were principally manned by the International troops. One of the most important of these outside Canea, was under the command of Captain Egerton, Seaforth Highlanders, who had a lively time of it for the first month of the occupation with his mixed garrison of British, Austrians, Italians and Russians. The Christian Insurgent bands were mostly under the command of agitators from Greece, who were of all professions, chiefly lawyers and doctors, and constant attacks were made on important posts The principal leader in the Candia Province was a certain Captain Korakos, a Greek military engineer, from whom we received many insulting letters at first, but his tone considerably altered on the departure of the Greek troops, until he ultimately disappeared from the island, with not quite the same éclat as he had entered it.

We spent the first month of our occupation in carrying out field-days by way of demonstration towards the out-posts. These displays were a source of much conjecture to the Moslem inhabitants, who imagined that on each occasion that we marched out of the town, we were *en route* to attack the Christian insurgents, and attributed our return without firing a shot, to fear of our Christian Brothers. The Bashis, however made up for our apparent want of enterprise, and passing through the outposts, they used to attempt to cut off small parties in charge of the cattle of the Insurgents. Though sometimes successful, they on the other hand, as often received more than they gave, and it was no unusual circumstance to meet on our march, some seven or eight dead Bashi-Bazouks slung over ponies, being brought in from the outposts to be buried in the cemetery just outside the principal gate of the town near our camp. The Christian cemetery had been violated before our arrival, coffins broken open, and it presented a horrible sight.

Officers were permitted to enter the town of Candia, or proceed as far as the outposts, provided they went in parties of not less than two in number and armed. The town, with its dirty Moslem bazaar, possessed far less attraction than a third-rate Indian city, and the curiosities imported from Constantinople by enterprising dealers soon lost their charm. Visits to the outposts generally involved being fired on by both Christians and Bashi-Bazouks. Endeavours were made to make a rough cricket ground in the ditch, and a polo ground of sorts on a flat piece of cultivation, within half a mile of the fortifications. With a little trouble, both these grounds were prepared, and afforded throughout our stay invaluable means of exercise and recreation to the British portion of the garrison. The Battery was very successful in the garrison contests at cricket, rowing, and tugs of war.

Crete is an ideal country for Mountain Artillery, and the transport of the country outside the towns is all pack. For a few miles inland from the coast line, the ground is broken up into nullahs and the few roads are stone causeways. In the interior of the island, the mountains run up to over 8,000 feet in some places, and their summits are covered with snow, for 8 months in the year. Towards the end of June the sun began to get very hot, especially in the early morning, when there was never any breeze, and in July, August, and September, the heat then was very great. The men troubled with vermin, heat, dust, and scarcity of fresh water, and with indifferent food, began to sicken, and we had many deaths from enteric and dysentery, losing 3 British officers and about 30 men of the force in Candia. Numbers were invalided, including our Battery Sergeant-Major. I had at one time so many sick, or at light duty, that I was very hard pressed to turn out the Battery. The officers suffered in succession (fortunately) instead of all together. However the arrival of a draft of men in August, put matters on a better footing. The sickness amongst the French troops at Sitia was worse than our own.

The events of the Greco-Turkish war were followed with much interest, as it was felt that until matters were settled on the Continent, no advance would be made towards determining the destiny of Crete, by establishing its promised autonomy. In the meantime, parties, with flags of truce, which I was occasionally allowed to accompany, were periodically despatched to the Christian Insurgents, preaching the propaganda of autonomy. But they would have none of it. "A bas l'autonomie! We are liars, murderers, and thieves," they said—"we cannot rule ourselves, and wish to be united to Greece!" After the withdrawal of the Greek troops, towards the end of May, they modified their cry, and substituted "Great Britain" for "Greece." It was not until August that they accepted the general principles of autonomy. The withdrawal of the Greek troops was not completed without some difficulty, as the Insurgents at first refused to let them go, saying that they had got them into the mess, and must now see them through it.

Colonel Vassos had to escape by night from the island, in a small sailing brig, and was captured by an Italian torpedo-boat, but it was thought expedient to let him proceed to Greece. A party of marines were landed at Platania, the embarking station, (a few miles west of Canea) and in small parties the Greek troops were embarked with all their mountain guns except two, which had been purchased and placed in position by the Insurgents on Akrotiri heights, outside Canea, and were not forthcoming. However, on the 27th May the last batch of troops were embarked for Greece. Their departure marked the first step towards a settlement. On the day of the Queen's Jubilee we had a full dress parade of all troops, for the inspection of the Foreign Admirals, and Commanders of contingents, who came round to Candia from Suda in the flag ships, and anchored in the roadstead. Much interest was exhibited in our screw guns, especially by the Russian Colonel-on-the-Staff, who was accompanied by the Commander of the Russian Mountain Battery, an elderly man who had fought at Plevna. The appearance of the harness, condition of the mules, and the mode of coming into action, appeared to interest them much. In the afternoon luncheon parties were given by the officers of the British contingent to 200 foreign officers, followed by international sports. In the evening a banquet was given on board the British Admiral's flag-ship, at which I suppose 60 officers, representing 8 nationalities, were the guests of Admiral Harris, who alone of all ranks received the Jubilee medal.

It was a unique experience under the circumstances and one which we are unlikely to take part in again. The ships were illuminated, and formed a grand spectacle, the ship of each nation vying with the other in the beauty of its display. It would be invidious to discriminate where all were so effective, but I think the Austrian and Italian flagships divided the honours of the evening.

A barge lit with Chinese lanterns and Bengal lights containing Italian seamen disguised as Venetian boatmen and minstrels, came alongside at the end of dinner and serenaded us. It was a beautiful night with nothing to remind us of the cause of our presence in those waters, except the sight half a mile away, of the Moslem town of Candia lying in sullen darkness.

The next day 14 shots were fired at us over our mess tent, and I was stoned by a crowd of lads when riding out with Colonel Murray along the ramparts. It was nothing very serious, but it showed the spirit of hatred towards us, with which the inhabitants were imbued.

I have alluded to the fact that our fresh water was mainly supplied from the condensing ship *Samaria*. It was generally warm and brackish when distributed to the men, and was not provided in sufficient quantities, owing to the limited condensing powers of the ship. The fresh water supply of the town had its source near Arkhanis, outside the out-posts, and in possession of the Christians. These latter were constantly cutting off the supply, in spite of the continual remonstrance of the British High Commissioner. He determined therefore, on 7th June, to take a force out to the water supply, some ten miles away, for the purpose of mending the aqueduct and interviewing the Christian chiefs at that place. Two companies of the Seaforths, a squad of the Italian battalion, a section of my battery and some Engineers, constituted the column. They encamped at Spilia, seven miles out the first day, and on the second day advanced to the aqueduct, but met with no resistance.

The infantry transport consisted of donkeys driven by Bashi-Basouks or rather ridden by them, as the animals carried the latter as well as their loads. The force remained five days at Spilia. This little expedition was the commencement of a series of visits to the insurgents' quarters beyond the outposts in different directions, by way of letting these gentry realise that we were not prepared to allow their behaviour to exceed a certain limit. In no case did they offer resistance. Indeed, the same men who would shoot you if they caught you alone would, when you went in a body, load you with gifts of fruit and flowers. As an example; on the day preceding one of these marches out, the Colonel of the Seaforths, who was to command the column on the morrow, was fired at whilst reconnoitring with his adjutant the road he proposed to take the troops, whereas, the next day he was overwhelmed with kindly attentions on the arrival of our column at the Insurgent village.

In July the Sultan having firmly established his position in Thessaly, conceived the idea of re-establishing his authority in Crete, which he considered had been temporarily usurped by the Powers, and who appeared to be unable to agree on the choice of a suitable individual as Governor of the island. He determined therefore, to send a former Grand Vizier, Djevad Pasha, to Canea as Governor, and proposed to reinforce his troops in the island. Both these requests being refused by the Powers, he decided to replace Tewfik Pasha, Military Commandant in Crete, by Djevad Pasha, who landed quietly at Canea on 24th July. Fresh intrigues at once commenced, and it was considered advisable to bring the British contingent in Candia (which had been considerably reduced in numbers by sickness), up to its full strength.

The remaining half battalion of the Royal Welsh Fusiliers were accordingly despatched from Malta. Two days after their arrival intelligence was received that the Turkish fleet had left Constantinople for a Cretan port, possibly Candia. At the same time a rumour went abroad that the Turkish Irregulars, (some 20,000) in Candia, contemplated rising against the International troops, in the event of the battleships being withdrawn from their positions off the town, to engage the Turkish fleet off Standia, an island five miles from Candia, in the roadstead.

Now our position in Candia, although an enormously strong one, from exterior attack, its walls being thicker and higher than any fort at Malta, was, as regards protection from interior attack from the town, absolutely exposed, and we might all have been shot in our tents any night by a comparatively small body of Bashi-Bazouks. The reason for not fortifying our rear, was in order not to hurt the susceptibilities of the Turkish authorities, who were still responsible, with us, for order in the town, and with whose troops we were supposed to be acting in concert. A council of war was held immediately and certain steps were resolved on, but no entrenchments were to be thown up, excepting some slight protection for the guns, unless certain circumstances supervened. I recommended that the next reinforcements should include a battery of 13-prs. moveable armament from Malta. Had these replaced my battery on our withdrwal from Crete, and the entrenchments arranged for been thrown up at the time I speak of, the attack on the camp in September, 1898 would posssibly not have taken place, as the guns could have been placed in positions commanding the streets. They were sent over after this attack, and the parapet was then put into a state of defence.

The Turkish fleet proceeded, one division to the Dardanelles, the other to Smyrna, but no farther. The Bashi-Bazouks thought better of the attack at that time, and deferred it, as we know, for 13 months.

About this period, (August 1897) two parties of officers from Candia, including one of my subalterns, were sent into the interior to report on the state of the houses and olive groves of the Moslems, who, at the commencement of the occupation, had been brought into the principal coast towns. They found the buildings in ruins, but the olive groves in fairly good condition, except in a few cases, where the Christians had cut them down for fuel.

A sanatorium was also established at Roggia, a hill village belonging to the Insurgents above the little cove of Pelio Kastron and about 8 miles west from Candia. Its position near the sea obviated troops and stores having to pass through the out-posts, the boats of the fleet conveying the necessary details to and fro as required. It was here, also, that the reinforcements landed, after the attack in September last.

We had a standing camp for some time there, and it afforded an agreeable change to the men, and much amusement to the unsophisticated inhabitants — light-hearted brigands — to whom no domestic details of the daily life of a soldier however private, seemed devoid of interest. The costume of both Christian and Moslem Cretan was loose, baggy knickerbocker, dirty white shirt, red cummerbund with a coloured handerchief or fez, (the former the distinguishing head-gear of the Christian the latter the Moslem), and long soft leather boots. They cultivate the olive and the vine, from which they make excellent malmsey. Every man carried a fire-arm and slung his body with numerous bandoleers of cartridges, of which they seemed to have an unlimited supply. As peace was signed between Turkey and Greece in September, it was with no surprise that on the 29th October orders were received in Crete that wooden huts were being despatched from home sufficient for the accommodation of one battalion of infantry but that the remaining battalion, the Seaforth Highlanders and the Mountain Battery, were to be withdrawn to Malta in reserve. On the 21st November the head-quarters of the Battery with guns, epuipment, and harness, together with the Seaforth Highlanders were embarked in the S.S. *Jelunga*. A subaltern officer's detachment with the mules of the battery were left behind for a month, and used as mounted escorts to the British Commissioner in his visits to the Insurgents' outposts. On one of these occasions the whole party were for some time under the heavy fire of the Insurgents, who until our party had arrived within 400 yards of them, pretended they had mistaken them for Bashi-Bazouks, in spite of the union flag carried in front of the escort. The fire was so hot that the party had to dismount with their carbines, and though advancing as much as possible under cover, it was only the bad shooting of the Insurgents which prevented many casualties. To atone for their error they feasted our men on roast lamb and red wine, and presented some woodcock, of which there are plenty, to the officers.

On the 21st December the mule detachment arrived at Malta where the Battery remained until the 3rd February, 1898, when it embarked for England minus 110 N.C.O's and men sent to the batteries on service in Tirah, and all its mules and cobs which were embarked for service in the Soudan. It arrived at Gibraltar on the 7th, where I was ordered to disembark a small party to take over a detachment of remount mules for the battery, which arrived at Newport on 13th February, having been absent just ten months from England.

In the spring of 1898, Germany and Austria withdrew their contingents from active part in the concert, and from the 21st November, 1897, till the out-break in Candia on the 6th September, 1898, the British contingent consisted only of one battalion, which up to the beginning of August, 1898, was the 2nd Battalion Royal Welsh Fusiliers, 600 at Candia and 250 at Canea. In August, 1898, they were relieved by the 1st Battalion Highland Light Infantry. The out-posts at Candia had been partially occupied by the British detachment during that summer, so that on September 6th when the massacre took place there were only about 130 N.C.O's and men, I understand, in Candia to repel the attack made on Colonel Reid's party of Highland Light Infantry at the Custom House. The British garrison was immediately increased by four battalions and the Turkish troops withdrawn. It was then composed of a battalion of the Rifle Brigade and Northumberland Fusiliers; the latter were withdrawn a few months later on the formation of the new gendarmery, and the former relieved by 1st Lancashire Fusiliers.

As regards the International troops it was generally admitted that the N.C.O's and men of the British contingent, both in physique, soldierly bearing, and general appearance took the first place. This was the more remarked on by the foreign officers as it was previously with them the general belief, that we had no regular troops worth speaking of in our Army, which they imagined was composed for the most part of Volunteers, generally devoid of military knowledge and discipline. The Russians were a fine body of men, and they and the Austrians may be said to have divided the honours of second place in public estimation. The movements of the latter with their rifle, which our infantry officers considered the most simple and effective in its breech block and magazine action, were most precise, but at Canea they seemed to devote an unnecessary amount of time to marching past. The former, the Russians, like ourselves, devoted much time to route marching. When marching at ease one man would start singing some National song in which the men joined in the chorus, and the rate of pace of the march, was made to fit in with the rhythm of the music,sometimes slow and sometimes very quick, the men all moving the arm not engaged with the rifle, to the time of the music. They say it eases the men, this marching at different rates of speed. This is I think open to doubt.

The Italian troops were sturdy, cheery little fellows, but very excitable and with vague ideas as to the necessity of camp sanitation, which was a source ofmuch inconvenience to the detachment of Seaforth

Highlanders who shared the same camping ground with them at Canea. The Turkish troops were solid in appearance resembling some of our better Indian regiments, but their officers for the most part were old and inefficient. Commanded by British officers the Turkish Army would, I fancy, be hard to beat; but for the most part badly drilled, clothed and fed, they are at a great disadvantage at present. A sentry would be on his beat for 12 hours at a time and although the slack-looking individual lounging on his post, appeared to be the last person in the world to interfere with the curiosity of the passer-by, let the latter have attempted to inspect one of the Krupp 6-in. B.L. guns mounted on the sea front, and he would have found the apparently lethargic-looking sentry suddenly electrified into life, and his curiosity remained ungratified

Though their Mountain Batteries are very fine troops, the French troops of the Marine were, I am afraid, not as in the other cases, invariably picked representatives of their country. Their physique was poor, and the fitting of their uniform indifferent. A perfect "entente cordiale" existed amongst the officers of the Russian, Austrian, Italian and British troops, and amongst all the Navies of the different Powers. The Italians, French and ourselves were dressed in khaki, except on grand occasions. The Russians wore their ordinary dark grey baggy trousers tucked into long boots, a white drill cotton tunic and cap cover. The Austrians wore their ordinary blue grey uniform with English pattern helmets. French more or less good or bad, was the universal language of communication between officers. Amongst the men a good deal of gesticulation and loud conversation each in his own language, seemed to promote much cordiality. Our own N.C.O's chummed mostly with the Italians, and the men with the Turks. I fancy a sort of recollection of service with Indian troops on the North West frontier, was called up by association with the Turk, which increased the latter's popularity. Though why their Mountain Batteries were christened "Malta Artillery" by our men I never quite understood.

The Mountain Batteries of the foreign contingents were armed with guns in one portion of about 2 cwt. The Shrapnel shell varies in the equipments from 9 lbs. to 12 lbs., and the muzzle velocity from 825 f.s. to 925 f.s. They are consequently less accurate at long ranges than our screw gun, as also than the 10-pr. B.L. gun adopted by Switzerland, which I recently inspected at Sion. The pack transport of the Russian Battery was pack horses of about 15 hands, like miniature cart horses. Including their baggage transport, 160 were brought from Sebastopol for the six guns, a section of the battery of 8 guns being left behind with the depot of the 13th Regiment F.A. in the Crimea to which it belongs.

The Italians, the French, (in reserve at Toulon), the Turks and the Greeks use mules in their batteries, but those of the French and Italian Batteries from their enormous size strike me as being more suitable for draught than for pack purposes. No relief line of animals is em-

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ployed, a simple system of shaft draught being provided, as in our Egyptian Mountain Batteries, by which when the nature of the ground permits, the gun and carriage (the trying top loads in a battery) are put into draught. In a mountainous country a relief is not considered necessary, as the going is so much more varied, and I must say that in a temperate, as distinct from a tropical climate, and with pannels, stuffed with hair instead of as in India with wool, there is much to be said against it. This shaft system is very light, was jointed in most cases, and always carried on the wheels mule In the French and Russian equipments the carriage is jointed, to allow of a heavier carriage, and so the recoil brought down to a closer limit than in our equipment; as also by using one piece only, to give the necessary increased elevation, when using curvd fire. In turn-out, the Russian Battery was the smartest of the Foreign Artilleries. But of course the continental idea of smartness of appearance differs much from our own. The Italian equipment is rough but serviceable, though their gun is feeble in power, and showed itself such in their war with Abyssinia. The equipment of the Turkish Batteries is quite pre-historic, port fires used instead of tubes, and their cartridges which are merely loosely tied bags of powder varying in weight according to the facility of escape of the grains of powder in each case. Their mode of bringing the guns into action, appeared to resemble a repository operation, time being apparently of no object. Their shooting also was most indifferent against the Insurgents, who had no respect for their fire, and fire discipline is unknown to them. The Italian fire discipline was I thought superior to that of the other foreign artilleries. Their system of ranging was the modified ladder system, resembling somewhat that experimented with at Okehampton last season; but spoilt by their neglecting to verify the trajectory before proceeding to time Shrapnel. The pack saddlery of the Russian battery was peculiar, layers of felt laid under a large leather cover covering the whole of the body of the pack horse and taking the place of pannels. The ammunition boxes of all the equipments were of wood instead of as with us, of the lighter and more serviceable leather. A pair carried from 12 rounds in the Russian to 20 rounds in the Turkish equipment.

In one or two equipments the boxes opened at the side instead of on the top, enabling the ammunition number to carry on his duties in action without exposing the ammunition. In most of the equipments the shell were carried fuzed.

I am inclined to consider it doubtful whether our present 2.5″ screw gun (about to be replaced by a 10-pr.) was the most suitable equipment we can employ for operations, such as we might have been engaged in, and most certainly not with the limited transport 38 mules with which we landed in Crete. The Russians had 160 pack horses with their battery. Fourteen additional mules were placed at my disposal by the A.S.C., by order of Sir H. Chermside. But even this only enabled me to take 32 rounds a gun into the field, and 1 spare mule per sub-division, but no relief line or artificers' mules. Now in our service, in which we may be called upon to act anywhere, the term Mountain

Artillery must have a wider signification than the word Mountain would lead us to imply. It must include all guns in pack trasport intended to work with infantry in the field, not only in a mountainous country, but under all circumstances where Field Artillery cannot work at all, or at the best, only practically as Position Artillery. For example, the 4 so-styled Field Batteries of the Egyptian Army are Mountain Batteries, as their equipment exemplifies, and their rôle a most useful one, though except possibly in Abyssinia, their usual theatre of operations is a desert not a mountainous range. Again in the case of the battery in South Africa, operations in the kopjes of Matabili and Basuto Lands, or on the cols commanding the Drakensberg Passes can scarcely be called mountain warfare in the widest sense of the term.

On the other hand in a purely mountainous district such as the North-West Frontier of India, pack artillery in its most efficient form must be employed, and guns with long range power and a large ammunition supply become inevitable. But as I have said Mountain Batteries are constantly engaged elsewhere than in the Himalayas, in minor operations in countries which although occasionally hilly, are genrally difficult on account of the absence of roads, the presence of heavy sand, rocky desert, dense bush or jungle, etc. It is generally found in these circumstances that our Mountain Artillery requirements would be satisfactorily met by a simple equipment enabling us to throw a comparatively few rounds of heavy shell at short ranges, either by direct fire at *personnel*, or by curved fire to search out the interior of the enemy's obstacles.

Many senior officers who have been engaged in operations of recent years on the North-West Frontier of India, are moreover agreed that our mountain guns in that country require to be supplemented by a small proportion of howitzers, to search out the reverse slope of heights and interior of obstacles. They quote (as what might have been useful examples of their employment) Dargai, and even as recent instances as the attack on Gumatti, on 6th February last, when it was officially announced that the failure of the expedition against the latter village, was due to the insufficiency of calibre of the mountain guns which accompanied the column. The 10-pr. gun will not meet this case, as the shell fuzed is only 2 lbs. heavier than our present 2.5-inch shell.

From a consideration of the preceding, I am therefore inclined to think that an equipment of howitzers should be introduced into our Mountain Batteries of the Imperial establishment, which should be increased in number, as also into our Indian establishment, to the extent of 25 per cent. of the armament of our British and Native Batteries.

Our Irish mules kept their condition throughout the hot summer in Crete, although fully exposed to the sun in open lines, and previously only accustomed to cool, comfortable, stables at Newport. We had no mule laid up with a gall of any description, and it was with great regret that I received orders at Malta on our way home, to send them on to Egypt for service with the 32nd Field Battery and 16 Eastern in the Soudan. We took over some Spanish mules which had been purchased in the neighbourhood of Gibraltar, but neither in bone, substance, nor constitution, can they be compared with the Irish mules they replaced. I trust, therefore, Irish dealers my be encouraged to breed mules in larger numbers than at present, for our home establishment.

In conclusion, I think it may fairly be stated that we all learnt something from each other and gained useful experience. The International Occupation enabled the European Powers without doubt to initiate the present satisfactory form of Government in Crete. Peace was its mission, prosperity its goal, and it has enabled the inhabitants of that unhappy island to reap in future the beneficient products of the soil, rather than has been hitherto mostly the case, the direful harvest of fire and sword (applause)

DISCUSSION.

The CHAIRMAN :—If there is anybody in the room ready to discuss the subject of the lecture we shall be very glad to hear him. As Major Simpson has raised some very interesting questions about the Mountain Artillery and I think there are a number of Mountain Artillery Officers here to-night it is to be hoped that some of them will give us the benefit of their experiences.

Major J. H. BOR, C.M.G., Royal Marine Artillery :— General Maurice, Officers and gentlemen, after the interesting lecture that Major Simpson has given us I do not know that there is much to add which would be instructive to an audience composed chiefly of Artillery officers. I quite agree with Major Simpson as to the superiority of the magazine rifle in action of some of the Foreign Powers as compared with our own. I think the magazine arrangement of the German rifle, of the Italian, the Austrian, and the Rrussian is much superior to our own magazine arrangement; for this reason, that they carry their cartridges secured in light aluminium fitters, as they are called I believe, so that when they open the magazine they simply slip in one of these fitters, each carrying five cartridges with it, so that they put in five cartridges with the same number of motions as are required to put in one with us Our magazine arrangement is very clumsy because we have to slip in one cartridge after another until it is full That was impressed upon me very much during one night attack at Izzedin when there was some prospect of our being rushed by superior numbers. I sent orders to the English detachment there to charge their magazines, and in the darkness and confusion several of the men let their rifles off accidentally. I think it is rather important to point that out although it does not concern the Artillery generally.

As regards the Turkish Artillery my experience did not quite agree with that of Major Simpson. He said their ammunition was old and obsolete. It may have been so as regards the Mountain Artillery, but I certainly found the fortress Artillery very efficient gunners. I had two batteries under my command at Fort Izzedin for three months, and I was much struck by the way they drilled. The armament in Fort Izzedin consisted of 12 16-centimetre guns and one 21 centimetre gun; the officer in executive charge there was a young fellow who had been educated in Germany and all his drill was carried on by trumpet sound, with the exception of naming the range and naming the target; otherwise he did everything by trumpet sound, and commanded the whole of the fort from his own position; the men marched out and piled their arms in rear of the guns, cast loose and loaded, and all the rest of it, and it was all carried on by the trumpet sound. As regards the Turkish garrison in Crete I do not think that many English officers realise that very few of them were Turks—the majority of the infantry were recruited in the neighbourhood of Aleppo and northern Syria and were Syrian Arabs and not Ottoman Turks at all. They could not speak Turkish and there was no sympathy between officers and men; on the contrary all the Turks, both officers and men, despised these Arabs very much. And in regard to Fort Malaxa, of which you saw a photograph just now, nearly all the garrison there were Arabs with the exception of five who were Turks; and, when it was necessary to surrender, the five Turks rushed down the hill—three got away and two were shot. The Turkish officers on speaking to me about it afterwards were anxious that these Arabs who had surrendered to the Insurgents, should be tried by court-martial and shot for it. They were handed over to the Turkish authorities, but I do not know what became of them. A great deal of antipathy has been created towards the Turkish troops in consequence of the occurrence at Candia last September, and I am glad to have the opportunity of saying that during the early time of the insurrection in Crete the behaviour of the Turkish Regulars was excellent; there was no sympathy between them and the so-called Bashi Bazouks—on the contrary many Turkish soldiers were killed and wounded in trying to suppress the outbreak in Canea. And as regards the charge brought against the Turkish troops of looting at that time, I only know of two instances in which it was brought home to them. One of the men who was caught looting was shot by a Turkish sentry, clearly showing that there was no sympathy with him, and the other was shot by a Carabinieri officer of the Crete Gendarmery. There really was at that time no sympathy at all between the Turkish troops and so-called Bashi Bazouks. The Turkish garrison disliked the Moslem Bashi Bazouks almost as much as they disliked the Christian insurgents, and the Turkish troops were only too anxious to get away from the island. There has been so much talk about " Bashi Bazouks " that I should like just to explain the real meaning of the word Bashi Bazouk. It is a word that has been familiar to nearly all Englishmen since the Crimean War, and it is a word which, I fancy is now familiar to all Europe owing to the disturbances in Armenia and in Crete. The general impression is that a Bashi Bazouk is a gaily dressed man, armed from head to foot, who goes about looking for some throat to cut or somebody to murder. The real meaning of the word Bashi Bazouk is simply nothing more nor less than our English word " Civilian "—that is all it means. If there are any armed irregulars about the regular troops call them Bashi Bazouks meaning civilians, and that is no doubt the origin of the idea held by most Englishmen that Bashi Bazouks mean irregular armed troops in the employ of the Government; whereas the word means "civilian," and so much so that, if a Turkish soldier was asked how gentlemen in this room were dressed this evening, he would say you were wearing Bashi Bazouk clothes. I do not think I can say anything more about the Turks—I might mention something about the Russians, because I had some of them under my command at Fort Izzedin. They were very merry fellows indeed—they always sang on the march as Major Simpson has described, and their songs were always, as might be expected, either about war or about love. They had also the peculiar habit of never carrying scabbards for their bayonets. And they were very religious—at anyrate in form. Every morning and evening the company officer used to go to the barrack room and have prayers there, and they all sang hymns to there heart's content. It is the general impression, moreover, that the Russian officers are much given to intemperance; but I must say that my experience of them in Crete was quite the contrary, especially amongst the Naval officers, and I had seen a great number of them before in different parts of the Mediterranean. They are exceedingly temperate amongst themselves, although they are very anxious to make their guests enjoy themselves a little too much. The Austrians struck me as being very much handicapped by the mixture of languages, especially in the Naval service, where they have three languages in use side by side in the same ship—the men coming from Hungary speaking nothing but Hungarian, those coming from Austria proper speak German, and those coming from the Dalmatian Provinces speak Italian, so that the officers are forced to give the details of drill and orders in the different languages in which the men can understand them, although the executive orders are given in German. I daresay many Englishmen do not know that the Austrian service is handicapped in that way. I do not think there is anything more of interest to be added to Major Simpson's lecture so far as my experience went (applause).

Major W. BABTIE, M.B., C.M.G., Royal Army Medical Corps:—General Maurice, Officers and gentlemen, I am afraid there is nothing I can say that will at all interest you except from the general point of view. Major Simpson complains that he had not got all the mules and transport and everything of that sort that he would like to have had; but he managed somehow or other always to have his Battery where it was wanted, and, if he was short of transport, he always concealed the fact most excellently (applause). I am certain that none of the Turks knew it at all events, and very few of the English. I do not know that I can say anything more except that I agree generally with nearly all that Major Simpson has said, and with what Major Bor has said. I think generally that the experience gained out there with all these different nations was most interesting, and, I think, valuable I do not think we ourselves failed very much in comparison, it may be prejudice on our part, but I think we came out fairly well. I think all the officers were extremely interested in the Turkish soldiers. The Turkish officers, as Major Smpson said, were old, and, I think, as a rule, effete. I know personally there was one officer who, after taking part in the Crimean War as a subaltern, was still on the active list in Crete at the age of 76, and I do not think that was a very exceptional case. We all admired the patience with which the Turkish soldier went about his work and in the hardships that be put up with, because he had neither clothing nor pay ; but on the other hand the Turkish authorities were always most careful that he should have an excellent ration—he was never starved—he might not have clothes or pay, but he always had plenty to eat, and I think that went a long way towards his contentment (applause).

The CHAIRMAN :—Has anybody else anything to contribute to the discussion—any officer of the Mountain Batteries ?

Captain T. W. G. BRYAN, Royal Artillery :—General Maurice and gentlemen. As I served with a Mountain Battery for some time I should like to make a remark about what Major Simpson said at the end of the lecture about the calibre of the Mountain gun. I cannot quite agree with what he said about it. It must be remembered that a Mountain Battery might have to work in very difficult country with a large number of targets, against savage races. I think what is wanted is a large number of rounds with the battery, so that it may be in action all day in an inaccessible country, and yet not be without ammunition. I think that means having a gun with a small calibre. For instance, if a gun was a 12-pr. and you had only got a few mules, as Major Simpson said he had in Crete, you could not have very many rounds. I think with an ordinary savage, or semi-savage enemy it does not matter so much how many bullets there are in the shrapnel—if the shells burst in the middle of the enemy that is about enough for them. The affair at Gumatti* was referred to—I suppose it was a Pathan village, which is a very strong position. There were a certain number of well armed men there fighting desperately for their lives, and there were only two mountain guns there ; so that I think it is quite reasonable to suppose that the calibre did not make such a great difference as was made out by the newspaper report. I think that question of the number of rounds ought to be considered in the calibre of mountain guns ; I think it is a very important fcator indeed, and I think it limits the calibre of the gun to a great extent.

Captain F. B. MAURICE, A.D.C., Derbyshire Regiment, :—General Maurice and gentlemen. Although I am not a Gunner I should like to say a word as to the recent operation on the North-West Frontier. I do not think there was any single occasion on which any Mountain Artillery had ever to send back for more ammunition, or was ever in any way pressed for want of ammunition ; but I have seen myself a large number of sangars, built of loose stone, which could be destroyed by a good kick, invaded with Shrapnel bullets which had failed to disturb the occupants at all. I do not know anything about ballistics or the effect of projectiles, but it seems to me quite possible that a gun of bigger calibre than we have at present might have been of great service to us during this operation (hear, hear).

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* R.A.I. "Proceedings," Vol. XXVI., No. 6, "A Small Fight on the Indian Frontier." By Captain G. R. Lamb, R.A.

REPLY.

Major SIMPSON:—I should only like to make two observations. First, Major Bor was quite correct in his surmise with regard to my remarks on the Turkish Mountain Battery—I did refer to it, and not to the Coast Artillery. I think that Captain Bryan misunderstood me; I did not wish to do away with the screw gun in India, but only to supplement it on certain occasions with a howitzer.

We have found it a necessary adjunct to our Field Artillery Shrapnel gun, and I think it would be found equally useful to supplement our Mountain gun in spite of its heavier ammunition—20 lbs. shell—(8 rounds per mule).

The CHAIRMAN:—Gentlemen, I think there is nothing else to do but to tender your hearty thanks, which I am sure you will all cordially give, to Major Simpson for his most interesting lecture (loud and prolonged applause).

APPENDIX.

LANTERN SLIDES.

The following illustrations relating to various incidents connected with the occupation of Crete were shown and explained by Major Simpson as the lecture proceeded:—

"Canea after Incendiary Fire."—The slide represents two different streets in Canea fired and pillaged by the Turkish mob.

"Bashi Bazouks at outpost near Canea firing on Insurgents."—Daily skirmishes took place between the Bashi Bazouks and Christian Insurgents as they were styled. The slide represents the outpost of Bashi Bazouks holding the village of Marnies near Canea.

"Off to Crete: Greek troops embarking at the Pirœus."—This slide shows the Greek troops *en route* to embark at the Pirœus for Crete where they were permitted to land and encamped some 7 miles west of Canea at Alikianu. I did not see them whilst they were in Crete. I however saw the Crown Prince's 1st Regiment of Infantry at Athens in October on their return from the frontier. I was not much struck with their appearance under arms, and considered they were not looking so happy, as 300 of their comrades—prisoners of war—whom I had seen previously at Scutari, accommodated in the barracks our troops occupied as a hospital during the Crimean War. They apeared to be well treated and were attired in a uniform somewhat resembling our Malta Submarine Miners.

"Attack by Insurgents on Blockhouse at Malaxa."—This Blockhouse was garrisoned by fifty Turkish soldiers and although the Insurgents were informed by Admiral Canevaro, the Doyen of the Council of Admirals, that they would not be allowed to occupy it, they procured some of Colonel Vassos' fiield guns, and carried the place.

"The Admirals enforcing their decisions."—Small vessels of the fleets accordingly opened fire and a shot from an Italian cruiser striking the Blockhouse, caused the Insurgents to evacuate the place quicker than they occupied it, and it was soon reduced to a smoking ruin. H.M.S. *Nymph* and one torpedo-boat destroyer took part in this affair. The large vessel on the right is the Italian B.S. *Sicilia*, the flagship of the International Fleet.

"Occupation of Crete: Arrival of Seaforths at Canea."—The Canea detachment had an easier disembarkation than the Candian detachment, the local difficulties of transport being very great at Candia, and it was very many days before all baggage and stores were transported to the Greek Church in which the British contingent was at first accommodated. The detachment at Canea was well received, because of the large majority of Christians in the town, and the troops were followed with enthusiasm by the mob to their barracks.

"British officers interviewing leaders . . . Candia."—These outposts were established with the object of doing away with the daily skirmishes between the Turks and Insurgents. Captain Grenfell, R.N., established the neutral zone round Candia. The Insurgents fixed upon a farm about five miles outside the town for the interview, and the officers were escorted thither, each party providing an escort half way. Leaders on both sides argued the point freely. On the top of the wall in the photograph is a group of interested Insurgents with their flag.

"Reinforcements of Army of Occupation."—The French reinforcement arrived in Suda Bay on March 21st. It consisted of half a Marine Battalion of the 8th Regiment of the Line. The detachment was unable to land for two days on account of a storm. Many of the men wore the Madagascar medal.

"Candia with war ships outside."—The head-quarters of the British contingent was on the west side of the town. Mount Jupiter on which was a strong Insurgent outpost, is on the left and Mount Yder in the distance on the right. That is the Greek Church occupied by a portion of the troops. This shews the entrance to the small harbour.

"Battery marching into camp."—Our camp looking east. This was a bastion held by Turkish troops, and along the sea front extended the camp of the Royal Welsh Fusiliers.

"Italian troops marching through camp."—This battalion of Italian infantry under the command of Colonel Zerie, arrived on the same day as ourselves. A parade of British troops and Naval Brigade was held in their honour on the third day after our arrival, and headed by the bands of each battalion in succession, they marched in column of fours through our ranks along the parapet, their position east of the town, where their men were accommodated in *tentes d'abris* and some Greek buildings.

"Occupation of Canea. Flags of Great Powers floating over Redoubt."

"Turkish Artillery at Canea."—What struck our officers was the apparently great age of the Turkish officers. The majority of the junior officers looked over 40, and their Field Officers were very venerable. Please note the Battery Commander.

"Peninsula of Akrotiri outposts."—This was the position of the outpost on Akrotiri, a peninsula which runs out to the eastward of Canea, from the outskirts of which it is only separated by a narrow neck of land. The distance to the Insurgent's outpost was only about 300 yards, and on the neutral ground between, the Insurgent Chief used to meet Captain Egerton to discuss the situation in a very friendly manner.

"Blockhouse of Perivolia occupied by troops of four Powers."—Here is an instance. The village of Perivolia having been attacked by the Insurgents because the springs which supply Canea are close by, a detachment of English, French, Russian, and Italian troops marched on the village on March 29th. During the advance up the hill shots were fired at them by the Insurgents outposts. A position in front of the Blockhouse however was occupied, and the flags of the four Powers were hoisted on the Blockhouse itself.

"Discussion of Admiral's proclamation of autonomy."—Much violent discussion invariably took place amongst the insurgents themselves on this burning question, especially over the placards concerning autonomy posted in the towns.

"Battery inspected by Admirals."—It was never thought advisable to take all the troops at one time outside the fortifications, as some attempts might have been made to prevent our re-entering them. On this occasion each unit formed up on its own parade ground. Ours was a pit in which were our mule lines. The Bashi-Bazouks invariably took much interest in our drills there, and would sit round the pit for hours, watching for an opportunity to steal some of the forage. They were not often successful.

"A group of International officers."—This is a group of the officers International forces in Candia with the officers of the Turkish troops in garrison. The Governor of Candia, Chefki Bey, who was also in charge of the town when the Turkish troops were sent away from the island, but not during the massacre of our troops.

"Returning to camp after the inspection."—This slide represents the battery returning to camp after a march out. It is however perhaps more interesting as shewing the town from the landside and our defenceless position from attack from that direction, to which I refer later on, the upper stories of the houses commanding the parapet in many cases.

"Armed villagers of Pelio Kastron."—This is a group of the Insurgents.

"British blue-jackets clearing out the Turks bag and baggage."—The last of the Turks in Candia. The order of the British Admiral was that all Turkish Troops should evacuate on the 5th December. With their usual procrastination not a soldier turned up till 11 a.m. when orders were given for them to commence embarking on board the British transport *Ocampo*. At noon they refused to move, accordingly the Rifle Brigade were ordered to compel them to embark. This battalion proceeded to the barracks and escorted them to the harbour. They were so slow getting on board that a detachment of blue jackets was ordered to assist which they did to some effect, the transport sailing at 4 a.m.

"Evacuation of Crete : Four Admirals." — This slide shows the Council of Admirals of the four Powers who wound up the affairs of the Concert, and handed over the government of the island to the present High Commissioner, H.R.H. Prince George of Greece, the central figure Rear-Admiral Noel; Admiral Bettolo, of the Italian Navy; Admiral Pottier, French Navy, successor to Admiral Canevaro, Doyen of the Admirals, and Admiral Skrydloff, Russian Navy. The latter officer is not without a sense of humour. On the withdrawal of the Austrian troops and ships from Crete last spring, two tennis courts belonging to them were annexed by the Russian officers. On its being represented to Admiral Skrydloff that the British officers would like the use of one of them, he directed one to be handed over immediately and in order to obviate any mistake in the future requested that one should be marked Port Arthur and the other Wei-hai-wei.

"Alpine Battery." — A section of the French Mountain Battery. The gun is a 12-pr. which rendered good service in Madagascar and Tonquin. The parade dress consists of the stable jacket with red cummerbund, loose trousers, putties and the Beret a cap resembling the Tam O'Shanter. The men are all mountaineers of the Alps.

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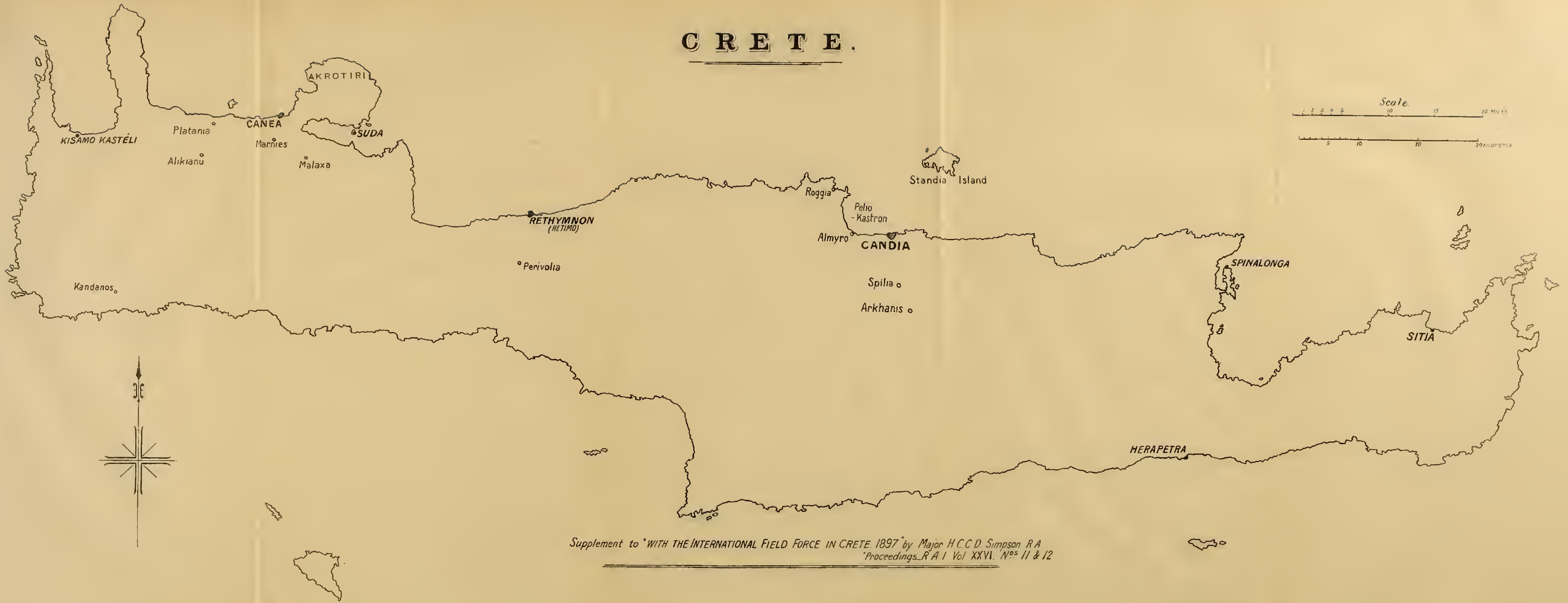

Supplement to "WITH THE INTERNATIONAL FIELD FORCE IN CRETE. 1897" by Major H.C.C.D. Simpson R.A.
"Proceedings R.A.I. Vol XXVI. Nos 11 & 12

KISAMO KASTELI
Kandanos

WEST DOWN, 1899.

BY

LIEUT.-COLONEL P. C. E. NEWBIGGING, R.F.A.

DURING the first fortnight of August a large number of batteries of Horse and Field Artillery were gathered together on Salisbury Plain to carry out purely "Artillery Drills." The force consisted of 2 Horse and 15 Field Batteries, and was placed under the command of Major-General Marshall. It represented the Artillery of an Army Corps, (with the exception of the Horse Artillery Battery of the Cavalry Brigade), and was divided into the three Divisional Artilleries and the Corps Artillery. Colonel Corbett commanded the latter, which was made up of two batteries R.H.A. and two Brigade Divisions R.F.A.

During the first three days merely preliminary work took place. After that, however, the G.O.C. continuously worked his command as a whole, dividing the work into days of drill and manœuvre, as appeared to be most required. A conference of all Lieut.-Colonels, Majors, and Captains took place each day at the Head-quarter Camp about two hours after the return to camp—an excellent arrangement which led not only to a pleasant gathering of old friends, but also to less pronounced differences of opinion than would perhaps have shewn themselves without the softening influences of luncheon.

West Down was of course new ground to us all. The going was very good, and the positions numerous and well-marked. It was rather curious to note how all the new names and places, which were at first so strange, became very soon familiar to everyone. I think that all of us felt an interest in working over this new ground, which in the course of a few years must become as well known to soldiers as the old familiar country around Aldershot.

Undoubtedly the most instructive days were those devoted to drill. In manœuvres, however excellent the scheme, it was most difficult to imagine, and allow for the other troops that would have been working with us. This appeared to be realized by the G.O.C. as he much preferred drill days to those of manœuvre; and no doubt the lessons learnt from the former were the most useful and instructive.

Perhaps the most notable difficulty which we realized at first was the long time it took to get batteries on the move after the issue of orders by the G.O.C. Especially was this noticeable in the Corps Artillery. Distances of course are great, and when orders have to be carefully read, maps consulted, and then further orders issued, first to Lt.-Colonels and then by them to batteries, it is evident that much time must necessarily be taken up. The problem of reducing this to the lowest limit possible was a task the O.C. Corps Artillery set himself to solve; and towards the end of the drills it was found that by following a fixed system the time occupied by this issue of orders could be very greatly reduced. The system followed will be found in the "Notes on R.A. Drills, 1899," issued by Major-General Marshall, the most important of which are appended to this article. In these notes are summed up all the lessons learnt; and it appears altogether unnecessary to elaborate them further.

Probably the most really useful instruction given was that in the supply of ammunition in the field. The difficult task of Ammunition Columns was carefully worked out; and I think it must be a source of gratification to many that, looking at the large number of Batteries and Ammunition Columns that have gone to South Africa, an opportunity was found to practice this most important detail of Field Artillery work.

I am sure that all who took part in the R.A. Drills at West Down in 1889 will always remember them with pleasure. The weather was fine; the going good; the field days were interesting and not too long, while pleasantest of all was the hearty feeling of *camaraderie* and good fellowship which reigned throughout the force; and which made the two weeks at West Down an episode in Field Artillery instruction which everyone who was present may look back to with pleasure and satisfaction.

APPENDIX.

REMARKS ON ROYAL ARTILLERY DRILLS, 1899.

BY

MAJOR-GENERAL G. H. MARSHALL, R.A.

Commanding Royal Artillery, Aldershot District.

1.—It is impossible for a large force of Artillery to occupy a position simultaneously or to manœuvre, unless there is absolute co-operation between Brigade Divisions.

2.—The importance of the simultaneous occupation of Artillery positions did not appear sufficiently realized. Except in cases when time is of vital imprtance such as in pursuits, guns should as far as possible, especially when liable to the fire of opposing Artillery, be brought into action simultaneously. The delay necessitated by assembling batteries or Brigade Divisions in preliminary positions which are not under fire, wll be amply compensated for by the increased effect and immunity from loss which will result.

4.—On service the Corps Artillery Commander receives copies of Army Orders. These are often of considerable length. The rapid transmission of such orders to the Brigade Division composing the Corps Artillery, as are necessary to ensure all appreciation of the situation, and instructions as to necessary movements, is a difficult matter, requiring consideration and careful organization. It was found most expeditious for the Staff Officers to read out the Corps Orders to assembled Adjutants, the latter taking down in writing from the Staff

Officer's dictation any essential extracts from the Army Corps Orders together with the orders of the O.C. Corps Arillery.

5.—It did not appear sufficiently realized by all Brigade Division Commanders that one of their most important duties is to watch the tactical situation whilst in action.

7.—One of the great difficulties in dealing with Artillery in large masses is that of "Danger Angles." Careful leading and the correct occupation of a position is necessary to prevent the occurrence of "Danger Angles," which may render large numbers of guns brought into action incapable of being fired.

12.—It is a great fault for a Brigade Division when under fire to limber up, and then wait on the position before moving off.

Brigade Divisions of Batteries, whether acting in Brigade Divisions or alone, when once limbered up should move without delay under the nearest cover, or at least out of the aimed fire directed on the position which is being vacated, and there await further orders. Similarly, though advances into action are to be continous as far as possible, Brigade Divisions and Batteries, unless the "line of fire" is indicated and the Commander is ready, should not come up on the crest line and unnecessarily expose themselves, but remain halted temporarily under any available cover.

13.—Brigade Divisions frequently formed battery column at once, when moving off from a position under fire; line should be maintained until the unit is under cover, or has moved sufficiently far to be out of the enemy's fire directed on the position just vacated.

17.—In a retirement it is important that specific instructions be given to the wagon line Commanders, as to the direction of the proposed retirement, and the new position which is to be occupied.

18.—It does not appear to be generally understood that the distance of the wagon line from the guns is based on the depth of the shrapnel zone. Thus, at extreme ranges, the wagon line at 200 yards may be safe from effective shrapnel fired at the guns, but at short ranges the remaining velocity of the shrapnel will necessitate a distance between the wagon line and the guns of 400 yards.

20.—When wagons are brought up for "Wagon supply" the horses should be sent to the rear as soon as possible, each team proceeding independently and not waiting for the remaining teams of the Battery.

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OF THE

ROYAL ARTILLERY INSTITUTION.

31st December, 1899.

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* Elected by Committee to fill vacancies which have occurred since last Annual Meeting.

HORSE BUYING AND BREEDING IN SOUTH AFRICA.

BY

CAPTAIN C. G. MACKENZIE, R.F.A.

HORSE BUYING.

STARTING at a week's notice we sailed from Southampton on the 1st July to purchase in South Africa what animals might be necessary for the Imperial Government to persuade Mr. Kruger of the error of his ways. The Union Liner *Scot*, on which we embarked, was taking out about twenty soldiers of sorts chiefly special service officers, whose names did not appear in the list of passengers, but whose embarkation, with full description was, I have no doubt, duly notified to Pretoria.

Other fellow passengers were Mr. Rhodes, Sir Charles Metcalfe, a Russian Princess, a Transvaal Government Official, a Free State Burgher, an Oxford Don, and several men connected with the Mining Industry. The Remount party consisted of Colonel Stevenson, Assistant Inspector of Remounts, three veterinary officers, self and four farrier-majors (one from Blues, 1st Life Guards, King's Dragoon Guards and Royals), all excellent men and very steady. We arrived at Cape Town on the 18th to be met by a rumour that Sir Redvers Buller had embarked on the Saturday before with 30,000 men, which news was, alas , to prove " previous " by at least three months.

On arriving at the Castle, which is the South African Army headquarters and the official residence of the old Dutch governors, we found that our business was the purchase of 900 cobs to mount a corps of irregular mounted infantry which was to be raised by Colonel Baden-Powell at Mafeking and Bulawayo and a certain number of mules to complete the regimental transport of the infantry battalion, stationed in the Colony.

A week was spent in tendering for contracts, and passing a small lot of 50 Army Service Corps cobs, already contracted for on the 26th July. Colonel Stevenson was permitted to make a contract for 450 cobs, at Kimberley within a month.

This contract was given to Mr. L. E. B. Homan, formerly of Johannesburg and now of South Africa generally in any part of which "Lieutenant" Homan knows, and is known by more men of all sorts and conditions, than perhaps any other man in the Colony. He is a type you only meet in new countries. A cheery good sportsman, a gentleman and English public School-boy, he started at Kimberley as a lad of 19, keeping books in a store. It was at the time of the first Kimberley boom when speculation in the diamond city was as active as it is now in Johannesburg and the young book-keeper blossomed forth into an owner of a race-horse. His employer not sympathising with these sporting proclivities it became a question of breaking up the stable or accepting the sack, and Homan chose the latter, since then he has speculated, farmed, raced and hunted the Johannesburg fox-hounds (until the Boers poisoned three couple of them) and has run through two or three useful fortunes without anyone having, to my knowledge, a word to say against his character as a good fellow, or an honest gentleman, and this is no slight praise to a man who has speculated on the South African Markets and raced on the South African turf. Our relations with him were most friendly and pleasant, we showed him absolutely no favour, and rejected his horses pretty freely, especially at first before he and his agents tumbled to what we wanted, but he was always perfectly good humoured over it, even when I expect he thought we were a little bit rough on his animals. He was an indefatigable worker, and spared no personal trouble or expense, to perform his contract up to time, which was by no means the case with other contractors, with whom we had dealings. Eventually he received the contract for nearly 800 of these animals, and I think, considering the price, did us very well. He assured me, and I quite believe him, that his net profit over this contract was 12%, which an ordinary business man, considering the risky nature of the goods, would consider but a poor turnover.

Now taking the general question of purchasing horses in a colony like South Africa, you can either buy straight from the farmer or employ an agent. It is needless to say that if you have unlimited time at your disposal, do not require a great number of animals and know the country thoroughly well, the former method is the cheapest, but it is out of the question when, as in our case, time is of great consequence and a large number of horses are required for a special purpose. The horses have to be bought originally from the farmer himself, on the farm, which means many hours drive and considerable discomfort to get perhaps one horse. The Dutch farmer will generally sell you his horse as a mount on which to fight his own brother, if he can get a sufficient price for him, but he will not bring him any distance for you to see, and if a remount officer advertised for horses to be brought to a certain place for his inspection on a certain day he might sit and whistle for the horses unless some enterprising agent had taken the matter in hand. If it is decided then to employ a contractor, my opinion (in South Africa at least) is that it is better business for government to give the work to one man. I should of course only give him quite a limited contract at first. If he performs that thoroughly satisfactorily, both as to time of delivery and quality of the animals, then give him the whole business. If you happen to know of thoroughly reliable agents to work the various horse breeding districts you might work through them confining each to his own district, but if, as was our case, you were obliged to start working from head-quarters, two or three contractors with their agents bidding against each other simply put the prices up and it became towards the end of the contract most difficult to get the horses at all. It is a mistake too I think, to deal with anyone (except in quite a small way) who has not command of a fair amount of capital. Directly a contract is given out it is known who has got it, and the big men whether they want horses or not, will generally do all in their power to prevent the smaller men fulfilling their contract by buying against them, the consequence being great delay in the completion of the business in hand. This happened to us on several occasions with small contractors chosen before our arrival. Besides the delay much inconvenience and waste of public money is caused when the inspecting officer, with veterinary surgeon and farrier, is kept waiting about to see a few animals which ought to have been delivered a week before.

The last occasion on which horses had been bought in large quantities was for Plumer's force which went up to assist in quelling the Matabele rebellion. Then 1,100 cobs 14·2 to 15 hands were brought in 14 days (10th—25th April) at a price of £18. It was a better time to find horses than August, when the horses have been subsisting on the winter veldt, and there was I fancy, on that occasion, very little veterinary examination. Anything that could trot decently sound was taken. However, these animals did their work well. They had to march 600 miles, carrying about 16 stone in less than 40 days, and though horse sickness was very prevalent in the district, their casualties were only 88 out of 1,100; I must add that on this occasion unbroken horses were taken, and there were I believe some funny sights as well as broken bones at the beginning of the march.

Any Englishman, fond of horses, landing in South Africa at the Cape will form a poor idea of the colonial horse. You hardly see a decent horse in the streets. The "rips" driven by the Malay cab drivers in their white hansoms (all named) look as they stand on the rank, hardly able to keep on their legs, but like the South African horse generally, they are better than they look, and friends who have tested them on long excursions, tell me that their endurance is surprising.

A cart horse you practically never see. The drays and trollies which in London are pulled by one stalwart shire, are here drawn by a team of four mules. There is no doubt that the Cape horse must have sadly deteriorated since the days when the Indian Government used to draw its best remounts from the Colony. Carlessness in breeding has brought the size down so that now the horse of the country is a cob of about 14.2, generally with indifferent shoulders, and inclined to be flat sided but able to carry weight for long distances at his own pace, on the roughest of rations so that for Mounted Infantry purposes he is infinitely superior to the imported animal whether from North or South America, or from Australia. Horses over 15 hands which are not weeds, are very hard to find, and I doubt a remount officer being able to get 300 in a month out of the whole of Africa. I am convinced that in certain parts of the country large horses could be bred. At present most of the breeding is in the hands of Dutch farmers, who are absolutely careless about the stallions they employ, generally letting a pony of their own run loose among the mares on the veldt. Breeding on these lines it is not surprising that a race of ponies and not horses is the result. A well-known and successful breeder of blood stock out here, Mr. Charles Southey of Culunstock, was very keen on crossing the colonial mare with good hackney stallions, returning to the thoroughbred after two generations. He argued that the Cape mare being weedy would only become more so by constant crossing with the thoroughbred. Personally I confess to the usual prejudice of the hunting mare against the hackney, and I fail to see why properly selected thoroughbreds should not do as much as the hackneys, to produce substance, without running the risk of introducing softness into the colonial stock, but no importation of stallions by Government or private enterprise will do any good until the farmer is taught to believe that it will pay him to breed larger stock. For his own riding he prefers a cob and if by chance he has a 15 hand horse generally uses him for harness; and as a rule, he will not take the trouble to send a mare an hour's journey to a good horse, when he has a stallion of any kind running on his own farm.

The best horse breeding districts are near Malmesbury, Colesberg, and Aliwal North in the Colony, the eastern portion of the Orange Free State, and Natal.

Some excellent ponies are bred in Basutoland, the one portion of South Africa which has never been conquered by English or Dutch. It is a hilly country lying on the eastern border of the Free State, inhabited by the Basuto race, brave without being reckless, and adepts at fighting on horse-back in a mountainous country. They now live governed by their own chiefs under a British resident magistrate, Sir Godfrey Lagden, at Masern. Addicted as most Highlanders are to cattle lifting, they have at the same time annexed good horses and mares from their Free State neighbours, and the result is a race of hardy mountain ponies rarely more than 13.2 in height, active as cats, up to considerable weight for their size, and very hardy. I went out shooting one day with a party of Dutchmen not very far from the Basuto border. One of them a lanky Dopper who must have walked, 14-st., rode all day a little Basuto of about 13.1, and it was wonderful to see the little beggar amble down the sides of rocky hills, often nearly perpendicular, down which the rest of us discreetly led our steeds. I give a photograph of this pony and his rider, as they are both types of their species.

I bought a different class of Basuto pony for my own riding. He stood about 14.2, and rejoiced in the name of Lucas Jantye, the Basuto Chief who bred him. He had already been through one campaign, carrying an officer of police, and was a thoroughly comfortable

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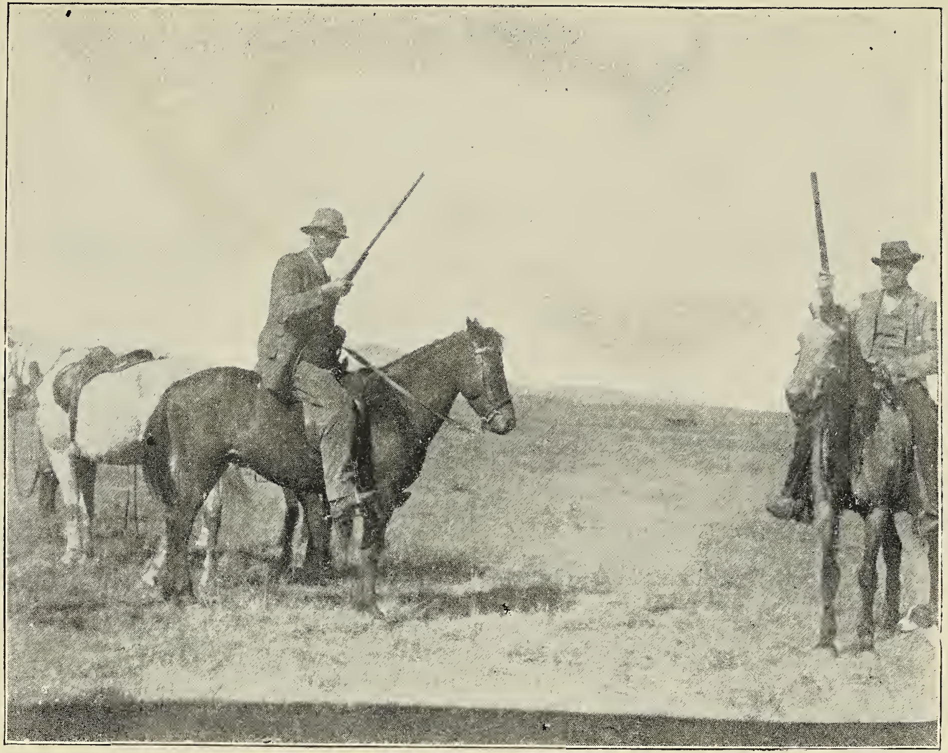

TYPICAL DOPPER BOER ON BASUTO PONY.

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rider, with the best of manners.

The transport of the country is usually carried on by teams of oxen, a team of eight span being the usual number. For faster work, mules are employed, mule breeding being carried on largely near Malmesbury and in all the horse breeding districts. The slowest and cheapest form of transport animal is the donkey, which I did not often see used.

The chief enemy to horse flesh in the Cape Peninsula is a form of biliary fever which most animals suffer from more or less when first landed. Want of lime in the soil and water also brings on a serious complaint, called 'oster porosis' rotting of the bone. A large number of our South American remounts were attacked by it, and it is very prevalent on the Randt. Ulceration of the bones of the face and fetlock joints is the most common sympton, but sometimes the spine itself is affected. A Johannesburg trainer showed me one horse suffering from it, which could not bear you to touch his back along the ridge of the spine, on either side of which the hair was coming off, and he informed me that he had lately under his charge, a horse which suffering from this disease, snapped his back in the stable for no other reason. Post-mortem examination showed the spine to be quite rotten. His only remedy, a kill or cure one, was turning the horse out on fresh veldt (possessing lime) for a year. Vet.-Lieut. Lane, A.V.D., treated apparently successfully several bad cases at the Remount Depôt, Stellenbosch, and at Wynberg, but his opinion was that no horse which had had the disease badly would ever stand hard work.

The most malignant enemy however to horses in South Africa is a disease peculiar to that sub-continent; horse sickness, a malady similar in many ways to pleuro-pneumonia in cattle, yearly makes enormous ravages in certain districts.

It is most fatal in Rhodesia, where many men of experience have told me that not more than 5 per cent. of unstabled horses survive the months from January to May. It is however, also prevalent in the Transvaal and Natal, and I believe occasionally visits at uncertain intervals, every horse-breeding district.

The man of science who can discover the means of inoculating against this pest will confer an untold boon on the South African farmer. An old transport rider who used to run the mails from the Orange River to Pretoria (a very bad district for horse sickness) told me that he avoided it almost entirely by never allowing his horses and mules to graze on the veldt during the rainy months. Directly they were out-spanned, crop was given them in nosebags, and the nosebags left on. If this is true, and I have no reason to doubt it, it looks as if the microbe thrived on the moisture of the veldt grass at that period of the year, which theory is borne out by the fact that stabled horses are rarely attacked.

My transport riding friend, alluded to above, assured me that in the pre-railway day he had to regularly do 250 miles a week, often travelling 50 miles without water carrying the mails up to Pretoria. He once with 4 mules drawing a cart carrying 3 passengers with their luggage, covered 500 miles in a week, and the animals were perfectly fresh at the end of it.

In South Africa every infantry battalion has quite a large number of animals in its charge .

110 cobs for its Mounted Infantry.

164 mules for its line of wagons, the idea being for each line to be self-supporting as far as transport is concerned.

A subaltern officer is told off to look after these transport mules, the Mounted Infantry Company having of course its own officers. The above seems a very large number of animals to entrust to the care of a dismounted unit, which up to its arrival in the colony has probably only had 4 animals to look after, and of course has no trained farrier of its own to assist the officers.

An infantry battalion in South Africa has an establishment of :—

10	buck wagons	drawn by	10	mules	100
6	Scotch carts	„	6	„	36
1	water cart	„	6	„	4
1	Ambulance	„	6	„	6
	Spare				18
	Total				164

For each cart 2 civilian drivers are allowed. These are generally Cape boys, and wear a colonial hat with the regimental badge attached to it, and are under a white conductor.

The transport officer has to assist him, one sergeant and a private for each buck wagon.

A cavalry farrier sergeant is attached to the regiment and has to assist him, one shoeing smith (infantry) and, perhaps, two infantry soldiers who have been through a course of cold shoeing.

Certainly mules, and I think mounted infantry cobs also, should in this country be branded with the broad arrow on the neck or quarter, so that they can be easily recognized if they get lost on the veldt or elsewhere. Marks on the feet are very difficult to see, especially when it is wet, and a mule won't as a rule let you pick up his feet to search for marks. When standing in camp, if a mule goes astray, the boy, to save bother takes the nearest one he can get from a neighbouring mine, which is the cause of constant confusion, which would be obviated by branding a regimental or local number on the skin as well. This was done, with excellent result, after our arrival.

My next order was to proceed to Basutoland. Much to my regret I was, at the last moment stopped from going into this interesting country, (it was thought that the stock of decent sized ponies was exhausted), and I only got as far as Zastron, a town in the Orange Free State, about a day's march from Masern the Basuto capital and residence of the Commissioner. Zastron lies well in the conquered territory, a strip of country sliced off from Basutoland, and given by us to the Free State in 1869, when we took the Basutos under our protection. About three miles away from here is a hill, where in 1865, a party of farmers surprised over 500 Basuto warriors who had established themselves in what they thought an impregnable position with their cattle and ponies. The hill is called "Vecht-top" or Fighthill. The Basutos were in the "kranz" or bowl on the top of the hill, which rises for about 200 perpendicular feet from the sloping sides. This kranz was approached by only one goat traik which none but the Basutos knew. The secret having been betrayed one day by a native, a small party of Boers gained the summit and commenced shooting. The whole crowd of Basuto warriors were seized with panic and rushed helter skelter over the fatal sides of the mountain, not one escaping, and their bones remain there unto this day.

Photographing this hill nearly got me into trouble. Zastron boasted of a bellicose land rost (J.P.) who, (through no fault of mine) spotted us on our arrival as red jacket-soldiers, "roi batjes" and expressed in the hearing of our Anglo-Dutch companion (Homan's agent) the great pleasure it would give him to put a bullet through either me or Griffiths, the Veterinary officer with me. Hearing of my going to photograph Vecht-kop he wired to Bloemfontein for authority to arrest me as a dangerous spy, and also telegraphed to his brother landrost at Rouxville to take me on my way down, in case I left Zastron. Luckily calmer councils prevailed at head-quarters and he was told to mind his own business. Maynier, a capital specimen of loyal Dutch Africander, who has served with credit in most of the native wars of late years, and who is reputed to be the most knowledgable man about horses in the Aliwal district, had brought together a capital lot of ponies for us to see. About 80 or 90 all drawn from Basutoland or its borders. As there was a certain amount of feeling about our being there at such a time, some of the farmers saying they would not permit the ponies to go over the Orange River, I thought it wiser not to brand or mark the animals we accepted, but to mark wth the scissors those we rejected, and leave the others to be branded properly when safely in the Colony. The Dutchmen, who would congregate in the "kraal" where I was buying, could not make out what I was doing sending away the best ponies, and carefully marking the crocks and at length shrugged their shoulders and departed with the idea that the "roi batje" officer was a "verdomde" bad judge of a horse.

Having bought 50 Army Service Corps' cobs in the Cape Peninsula, I had to proceed to Malmesbury to purchase the balance of the mules contracted for previous to our arrival. Mr. West (5th Lancers) who had been doing this work had had considerable difficulty in getting the contractor, a "canny-cute-sly-slem" Dutchman, to deliver animals of decent quality, though he was getting a great deal more than their market value. On one occasion he showed 110 of which only 6 were accepted. The day I went down previous lessons had borne fruit, and I was shown a very fair sample of mule which was only right, Malmesbury being in the centre of one of the best mule districts in the colony. The sizes varied from 12.2 to 14.2, the average price in times of peace, for a 14 hand trained mule being about £18. We were only buying mules 13 hands and over. This price is of course very fluctuating and before the great outbreak of rinderpest in 1896 (which decimated the oxen) it was much lower.

The South African mule is "tamer" than his cousin from South America, but even he requires handling with a certain amount of caution, and is, as a rule, much more amiable with a black "boy" that with a white man.

These little beasts are not so easily affected by the tsetse fly or horse-sickness, as horses are; they are hardier, live longer, will eat almost anything, and will go further without water; qualities which make them invaluable transport animals.

A good trek ox in time of peace costs about £8, and a donkey about half that sum. The moke is not subject to horse sickness.

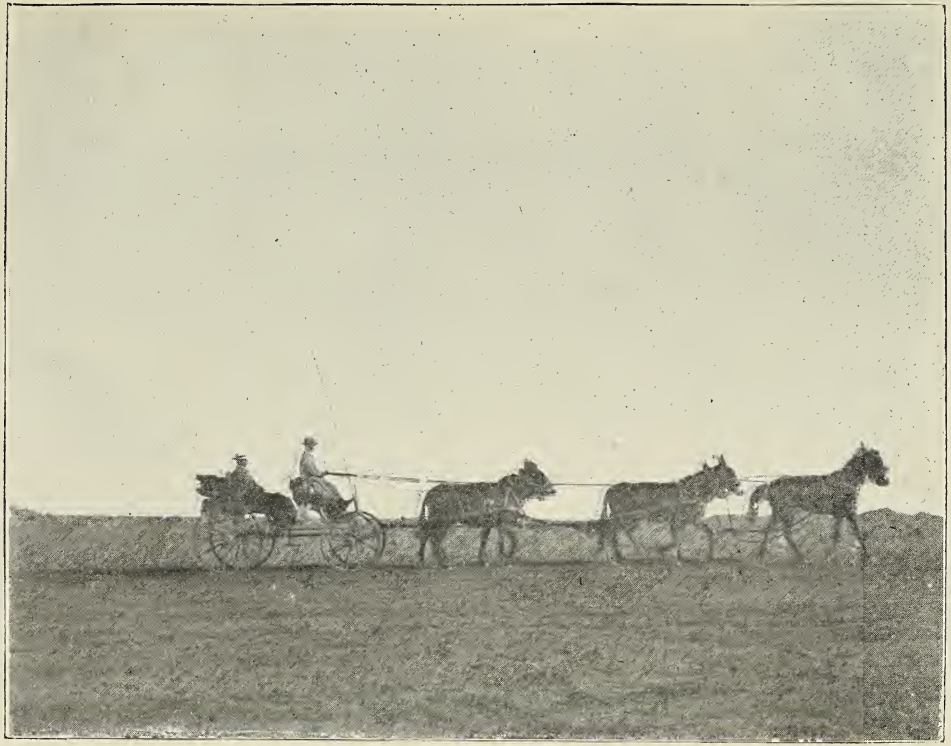
We started away at dawn the next day, three boys driving our 70 purchases loose over the veldt, They take a bit of whipping in at times, when they meet parties of friends and relations out grazing, but we got them all safely over the bridge by nightfall.

The Monday following I had to go again to Rouxville where several farmers had promised to bring Maynier horses for me to see.

My Zastron fame had gone abroad for every farmer within distance of Rouxville who had an ancient maimed, sick, or ill shapen horse brought him to the market place for me to buy, and were grievously hurt, some of them, that I could not do business.

I should like to say a word or two here, concerning the Boer, as I found him at a time when relations were, to put it mildly, strained. Individually they are good fellows enough, and have any number of qualities we as English and sportsmen can admire; they are very hospitable and I, a stranger and possible enemy, was given the best their farm afforded—shooting, horses to ride, and the best of their food and drink, whch last consists of nothing more exhilarating than coffee. Their chief defect is an unconquerable "slemness" which I can only describe as Scotch "canniness" only more so. In many other ways such as religion and habits of life, they strongly resemble the lowland Scotch, yet the most rabid Anti-Boers whom I met belonged to this description of Anglo-Saxon.

We travelled when away from the railways in a spider drawn by 6 mules or ponies driven by a diminutive Hottentot boy, a really wonderful whip. I should have liked to have seen Morley Knight or Curly Birch on the seat beside him. Even these artists would have learnt something, at least as regards driving mules. He had a separate swear word for each mule, and got the right amount of work out of each member of his rather scratch team. He had two whips, one a short "sjambok" for the wheelers, the other a tremendous long bamboo cane with an ox hide thong tied on to it. This can only be used properly by holding it with both hands. At other times it hung out at right angles from the driver's seat. It is true that periodically the end of the thong would catch round a rock, or even get twined round the nave of a wheel, when 'Suppe' would pull up his team, search for the broken point, splice it on again, and start afresh. These little stoppages did not hurt. They breathed the mules.



DRIVING SPIDER AND SIX.
Four mules, two ponies (in the lead).

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As doubtless everyone knows, the 1st July in South Africa answers (as far as the seasons are concerntd) to New Year's Day here, and all horses are aged from that date. When we stared our work (in August) the spring was only just commencing so that horses were seen at their worst, most of them having been subsisting on the veldt all winter.

The winter is the dry season up here (except at the Cape itself), but this one had been unusually wet, so that there was a fair amount of keep for the animals.

Horses are never clipped out here, and little is ever done to enhance their value by those adventitious aids, the use of which an English dealer knows so well. My veterinary assistant (during the latter part of my travels) Lieut. England, who had been out in the country some years, and served through the Matabele Campaign, was an expert with the knife and scissors, and would very quickly transform a likely looking cob into quite a smart hack. He so metamorphosed a rough little shaggy Basuto, which his owner, a Dutchman, after much haggling had parted with for £13, that the Boer when taken to see him after the operation, turned his back on him and walked right out of the kraal, vowing that he had been " done in the eye " by the ' verdomde roinek.'

There is one thing contrary to all our stable maxims, which the Africander does invariably, and that is, off saddles directly he comes in, apparently with no evil results. The great secret of travelling out here is to ' out-span ' or off saddle (either with horses or mules) at least once every two-and-a-half hours. Even if you have no water or food for them, the animals will find refreshment from a roll and a stale, and after half an hour to an hour's rest, will be quite ready to go forward again.

An indispensable adjunct to a South African horse's saddling is the ' reim.' This long strip of untanned oxhide is attached to the head collar, and if there is any danger of the animal straying, one end of it is fastened to a fore-leg just above the knee, allowing the horse to graze but preventing his straying any distance.

A thoroughly well trained " shooting horse," however, does not require this restraint, the ' reim ' thrown over his head is quite sufficient.

Fortunately the Africander horse very rarely requires to be shod, as the shoeing generally is very bad, and if by chance a farmer has to shoe his pony, he will probably leave the shoes on until they literally drop off.

Take him on the whole he is a very sound animal, and practically free from roaring and kindred complaints of the respiratory organs.

The food of the stabled horse out here is " forage." Forage means oats given in the ear with the straw, as it is cut. Careful people give it in the form of crop, but it is very frequently shown in the manger in its natural state. Corn is also given—mealies, (Indian corn) generally, but sometimes oats, as at home. I have never seen hay used here, except once, for bedding. A Johannesburg trainer told me he gave English hay to his race horses at a price of £20 a ton. Lucerne is very freely grown round some farms for the horses, and yields three or four crops a year.

It is, for obvious reasons, most important to brand your purchases immediately. To enable you to do this satisfactorily and without unnecessary delay, it is important to impress on the contractor to have as many boys as possible to assist in holding the animals, but you should always have one reliable white man to assist your farrier. It is pretty hard work branding about a hundred animals at a stretch. Each animal requires five different operations, four numbers and the broad arrow, and it is a great advantage to your operators to have an assistant whom he knows and can rely on, instead of having to trust to a casual man. We branded our mules with local numbers (running into four figures) on the off side of the neck, and the broad arrow on the near. Horses had the broad arrow branded on the near thigh, and the number on the near fore foot.

Mules are funny beggars to brand, but we managed several thousand without having to throw one. A few very refractory ones had to be tied short up to a post by a stout cord, but the majority stood all right with a twitch on and a strong man holding them. We met on our travels several very fine specimens of Africanders, burly transport riders who understood mules thoroughly and could do almost anything with them, partly by brute force, but more by talking to them, and addressing each of their own mules by name.

The Dutchman accounts for the vagaries of the mule by the fact that he is an invention of man and not of the Almighty. I am afraid he is an animal that can only be satisfactorily controlled by firmness rather than kindness. It is advisable before approaching a strange mule either for examination or measurement to have a bridle put on him with blinkers on it.

The horses of South Africa are naturally very docile, and you comparatively rarely see a vicious animal or a buck jumper. As an instance of their natural quietness, I give a photograph of two babies who had been standing like this for half an hour, with no one at their heads, out on the veldt whilst we were having a swim.

It is lucky that these animals are naturally sweet-tempered because, as a rule, on farms they are very badly broken. A nigger boy who can stick on a bit is put up on a youngster and hoorooshes away with a sharp bit in his mouth and a 'sjambok' in his hand, frightening the poor little horse out of his life. You hardly ever see a bridoon out here; either a sharp single curb, or a Pelham, is almost always used, and for dirty old bits and disreputable leather work South Africa takes some beating.

The pace of the country, an acquired one of course, is the tripple. It is claimed that a horse which can tripple well, (and a well trained trippler fetches a bit of money out here) will cover a long distance with the minimum amount of fatigue to himself and his rider, though I fancy it is the latter that is chiefly considered. Personally I did not like the pace; perhaps I was never on a really high class trippler or perhaps it was that I was not used to it. It is something like an amble, only not so comfortable, as you feel the working of the animal's

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PAIR OF TWO YEAR OLDS LEFT STANDING ALONE ON THE VELDT AT ALIWAL.

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shoulder between your knees as he scurries over the veldt. An Argentine pony's amble is rather comfortable, when you have got over the feeling that you are riding a 'stiff 'un,' but I much prefer an English trot or canter to this tripple.

We are now, the 1st October, waiting for the outbreak of war, which in the opinion of practically every Englishman out here, can alone settle the differences between Great Britain and the Transvaal. We are very busy buying large quantities of horses, cobs, and mules, and at the railway junction of De Aar, which they are making into a military depôt, I have passed over 500 animals during the last week, and the cry is still "they come."

HORSE BREEDING.

Whenever we had an opportunity of going over a South African breeding stud of course we seized it. Amongst others we visited the two largest breeding farms for blood stock in the Colony. The first, belonging to Mr. Alexander Robertson, is situated near Colesberg, in the extreme north of the Colony, not far from the Free State border. Mr. Homan, who was contracting for us, is partner in this stud, the best sire of which is that fine horse Nunthorpe, which used to carry Colonel North's colours in England. This grand-son of Camballo out of Matilda stands 16.2½, without being in the least "on the leg," and with his great bone and substance ought to be the best possible mate for South African mares, which are apt to run light. The only thing one can find to 'crab' him with is that his hocks are slightly too bent. He won for his owner the Liverpool and Brighton cups, but his best performance was winning the Jubilee Stakes, carrying (I think) the top weight. He was foaled in 1886.

The other sire is Quickmarch, a chestnut son of Saraband out of Marcia, a small horse, very smart on the turf here at 5 furlongs.

The stud consists of fourteen mares, the best of which, Celery by Springfield—Celandine by King Tom or Macaroni, is perhaps as good a mare as there is at the stud in South Africa.

Another a Colonial mare, bred on the farm, Irene by Sir Amyas Leigh—Esther Stockwell made a name for herself on the South African turf.

It was the worst time of year to see horses, and the day we inspected the farm was a most trying one. A high and rather cold wind making their coats stare, and the animals look generally tucked up, and we came away with the impression that as far as size and quality went, there was a falling off in the stocks bred out here from English parents. This impression was removed by our visit to the next stud, at Culmstock, near Schoombie, on the northern edge of the Great Karroo. Here, on a farm of 7,000 morgen (more than 14,000 acres) Mr. Charles Southey, a nephew of the poet, and son of the secretary of the victor of Boomplats (Sir Harry Smith) has for years been a successful breeder of blood stock. His two stallions are Pearl Diver by Necromancer and Wroughton, neither of which can compare, to look at, with Nunthorpe, though the former is a very taking looking horse, and about the most successful stallion out here.

I have never seen animals looking better than Mr. Southey's mares. Out on the veldt the whole vear, with nothing whatever to eat but the Karroo herbage, they foal without assistance in the open air, and loss from this cause is practically unknown. I saw two foals, just born, trotting after their mother and both parents and offspring looked as well as possible. Here there is certainly no deterioration in the native born stock, several of the Colonial mares being bigger and better than their English mothers.

One instance is Mrs. Veal, a small chestnut by Robert the Devil out of Cipolina by Macaroni, which Mr. Southey bought at the Hampton stud sale about 20 years ago, during which time she has brought her fortunate owner a clear £2,000 in stock. She is a mare which I should have hesitated to take any distance to breed from, so small is she, but her stock have nearly all been much bigger than herself.

One, May Queen, which we saw with a foal at foot by Pearl Diver is a beautiful mare.

Another fine matron which we saw at Culmstock was Pauline by Paul (a brother of the ill-tempered Peter). This last is a most taking mare, and looks like breeding a weight carrying hunter, yet showing lots of quality. Of course Mr. Southey does his young stock well and gives them plenty of corn. He has a yearling by Pearl Diver out of Mrs. Veal, which ought to do something on the turf here one of these days.

From what I saw on this farm, it is clear to me that, given proper care, there is no reason why animals should not be produced in this country as large and as stout as in England. Doubtless, for some years to come, to prevent in-breeding, fresh blood would have to be introduced from home, and of course care would have to be taken in selecting a farm, to get one on which the soil contained a sufficiency of bone forming lime. Given a proper supply of water, which an enterprising farmer obtains by means of dams, the climatic conditions are all in favour of horse-breeding and we hope that the day is not far distant when means will be discovered of defeating the horse sickness microbe.

Good land, accessible to water, can be bought at £1 an acre, so that unlimited space can be cheaply obtained on which theories of breeding, which are out of reach of any but millionaires in England, can be worked out in South Africa.

In the Colony or Free State I found however no trace of any systematic breding except that of blood stock.

The De Beers Company at Kimberley with boundless space and unlimited capital at their disposal breed without any apparent method. At their stud farm we saw a Cleveland bay, an American trotter, three hackneys and three Arabs and a thoroughbred son of Donovan—Oakdene, which beyond the fact that he ran fourth in the Derby had nothing to recommend him as a sire.

As far as we could gather, these horses are mated indiscriminately with the native mares without any special care or selection. On Dutch farms we visited, owned by men of wealth and intelligence, the same apparent want of method existed. On one in particular near Colesberg there was an enormous number of young stock of all sorts and sizes, which, as far as we could gather were bred on the following system. The foundation being the native mare, the owner started with a thoroughbred sire. His stock rapidly getting too light he bought a Percheron sire. This grey Norman horse very soon brought the stud to the other extreme, so the Dutchman bethought him of the hackney which he used for several years, when he considered he wanted more substance again, so off he goes to the Port Elizabeth show and purchases a shire (and not at all a bad horse either) who shared the harem, when we visited it, with a hackney. To end up with, the mares in their declining years were mated to a Jack donkey and I am not at all sure that their progeny from this union was not the best of the lot. The remainder, as we saw them in the kraal, were a queer crowd.

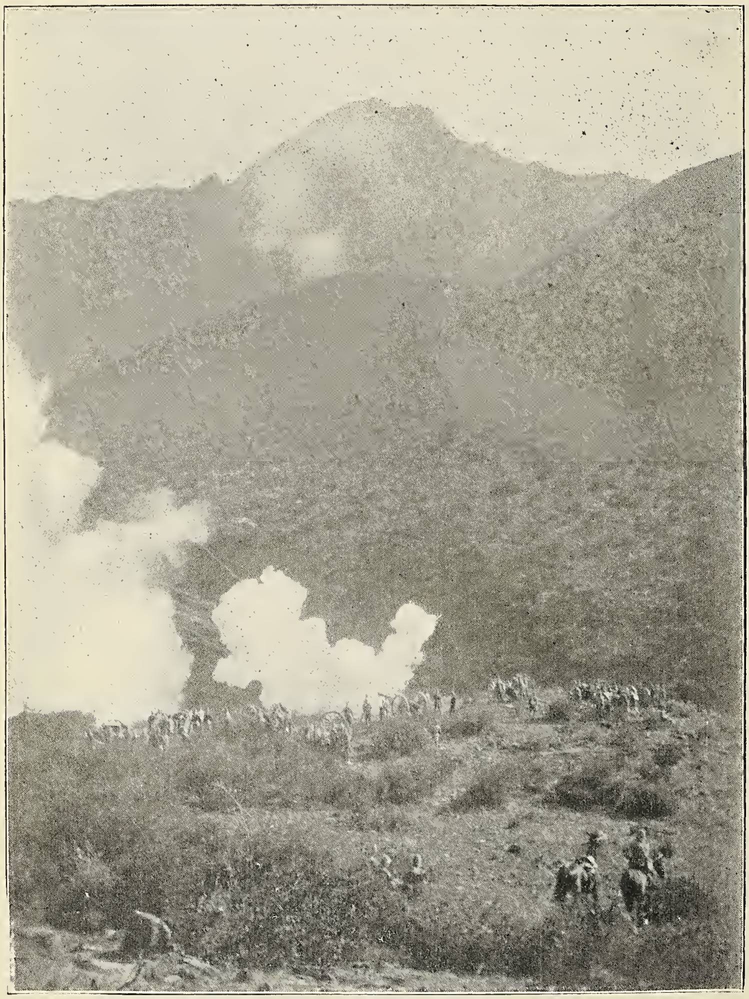
When once it is made evident that we intend that the British flag shall remain flying over South Africa, which in the opinion of most Colonists is all that is needed to allay the bitter race feeling which has only arisen in the last twenty years, it is to be hoped that British enterprise and capital will be attracted to the Colony for other purposes than gold mining or diamond digging, and that the class of Englishman who now goes ranching in Montana or the Argentine will take up farming and horse breeding in this Colony. With energy and a moderate capital (necessary for irrigation) he can hardly fail to do well, and to anyone at all delicate as to his lungs the higher portions of the country are most beneficial. At present most of the land is in the hands of Dutch farmers, and it will be a good thing for them as well as for the land when a larger proportion of it comes into the hands of the more progressive Anglo-Saxon.

To conclude, with all its drawbacks, its monotonous want of trees, the sameness of its flat topped hills, and its waterless rivers, it is a country which takes hold of English settlers, and grips them so that they are loth to quit it, and anxious to return to it when they come " Home " on a visit.

Though I cannot understand this, believing firmly that there is no country to live in that can compare with England, yet it is a fact, attested by many an Englishman who, after being 5 or 6 years in the Colony, has tried going back to England and found that the life did not suit him.

It is the want of liberty and space perhaps that chokes him, but whatever it is, this love of the land of his adoption is a real one, and is one of the most hopeful signs for the future of South Africa.

Kimberley,
1st October, 1899.



10th FIELD BATTERY, R.A.

IN ACTION AT THE TANGI PASS, 7TH JANUARY 1898.

From a photograph by Lieut. E. F. Delaforce, R.F.A.

EXPERIENCES OF THE 10TH FIELD BATTERY, R.A.

IN THE

MALAKAND & BUNERWAL EXPEDITIONS

BY

LIEUTENANT E. F. DELAFORCE, R.F.A.

(A brief résumé of a Lecture delivered at the R.A. Institution, on Thursday, 9th March, 1899.)

COLONEL R. CORBETT, R.A., IN THE CHAIR.

IN August, 1897, after the relief of Malakand and Chakdara, a force called the Malakand Field Force, consisting of 3 Brigades and Divisional Troops (more or less an Indian Division of all arms) was sent to punish the tribes concerned in the attack on the two above mentioned posts.

The force was commanded by Major-General Sir Bindon Blood, K.C.B., and Colonels Meiklejohn, Jeffreys, and Woodhouse, commanded the 1st, 2nd and 3rd Brigades respectively. The Artillery employed with the force consisted of the 10th Field Battery, Nos. 1 and 7 British Mountain Batteries and No. 8 Bengal Mountain Battery.

The lecturer began by describing the events of the 2nd August, 1897, when the Battery was ordered to mobilize and to start at once for the Malakand—the hurried preparations, the sorting, packing, and storing of kits, the inspections of ammunition and horses—and lastly, the entraining, at midnight, for the base of operations.

The strength of the Battery leaving Rawal Pindi was as follows:—

5	Officers.
146	N.C.O.'s and men.
9	Native Drivers.
58	Native Followers.
134	Horses.

The names of the officers were:—

Major C. A. Anderson.
Captain L. Forde.
Lieutenant C. N. B. Ballard.
„ E. F. Delaforce.
2nd Lieutenant E. H. Collen.

Next the onward journey of the Battery was described at each stage of its march. The troubles and hardships began almost at once; at

Hoti Mardan there were 4 cases of heat apoplexy, and at the next stage, Jalala, eleven, (in one or two cases almost proving fatal), but the most trying day of all was the stage from Jalala to Khar in the Swat Valley, about 24 miles, crossing the Malakand Pass on the way.

The Battery left camp at midnight with a convoy, and reached Dargai at 5.30 a.m. where it was expected it would encamp for the day, but on receipt of a telegram from the Swat Valley to join the 1st Brigade at Amandara as soon as possible, it was decided to push on, and so at 11 a.m. the Battery made a fresh start—a steady climb of 1500 feet in six miles—to the crest of the pass, and then an easy descent for four miles into the valley beyond, was the prospect before the Battery. Not a pleasant one—considering the terrific heat, and it was not accomplished without great loss. There were no less than 20 cases of heat apoplexy, two of them fatal, neither did the horses escape, 7 dying that day and 4 within the next few days, from the effects of that march. Ten days—practically without a move—then luckily followed, and enabled all hands to get fit and hard, and here a draft of men and horses from the 50th Field Battery brought up by Captain Oldnall, made the Battery up to strength. On the 16th Aug. the Battery moved up the valley a few miles to Thana, with the 1st Brigade, which, it was intended, should go for a tour through Upper Swat, after brushing away the opposition expected at the defile of Landakai—"the Gate of Swat." On the 17th August the Battery moved out with the rest of the Brigade and after a 4 mile march came into action at a range of 1500 yards against the enemy who held a very strong position on the crest of a steep ridge. After nearly two hours action, covering the very successful asault of the infantry, and entailing an expenditure of 132 rounds of Shrapnel, the Battery returned to Khar Camp, where it again remained idle for ten days. The lecturer here exhibited a standard captured in the action at Landakai and presented to the Battery by direction of the General Officer Commanding the Field Force (applause).

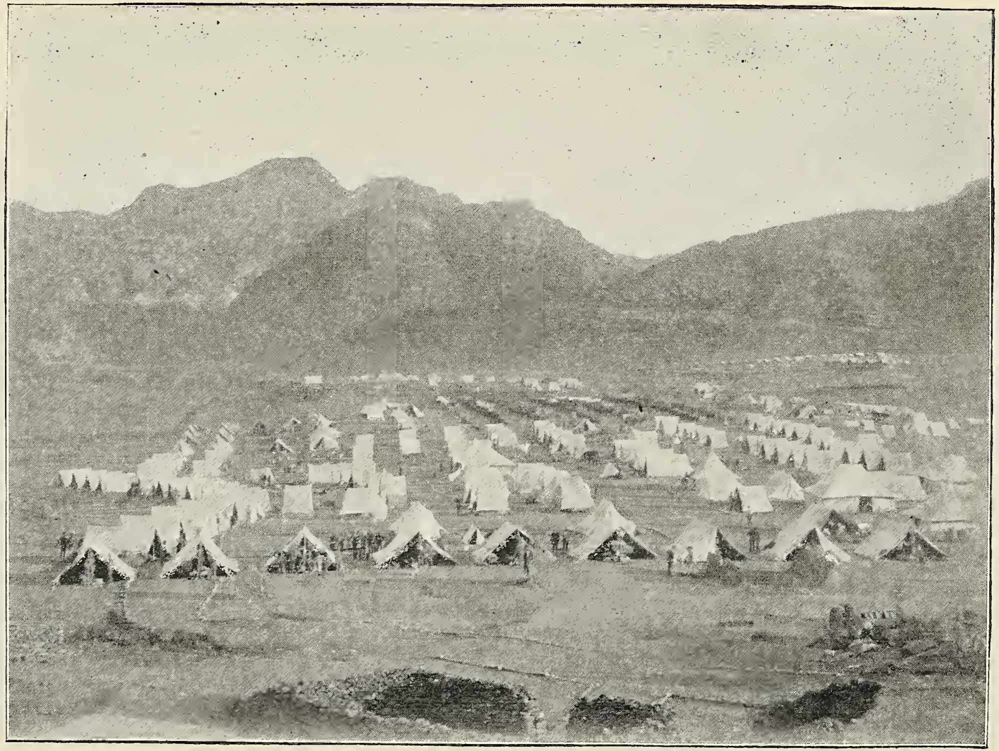
On the 29th August the Battery crossed the Swat river by the suspension bridge at Chakdara, and encamped under the walls of the fort. Two marches then took the guns to the Panjkora bridge, the wagons under the Captain being left at a post on the lines of communication about 5 miles from the bridge. The road to the bridge was of such a villainous description that the Brigadier (Colonel Wodehouse, R.H.A.) despaired of the guns ever reaching the bridge, but it was at last accomplished, and the Battery had the satisfaction of finding the following very complimentary order published in Brigade Orders.

Brigade Orders: 3rd Brigade Malakand Field Force,
Panjkora, 4th September, 1897.

"The Brigadier-General wishes to express his appreciation of the hard work and excellent driving performed by the 10th Field Battery, which enabled them to bring their guns to a position which it was considered impossible for them to reach, and which under certain circumstances might have been of the greatest value.

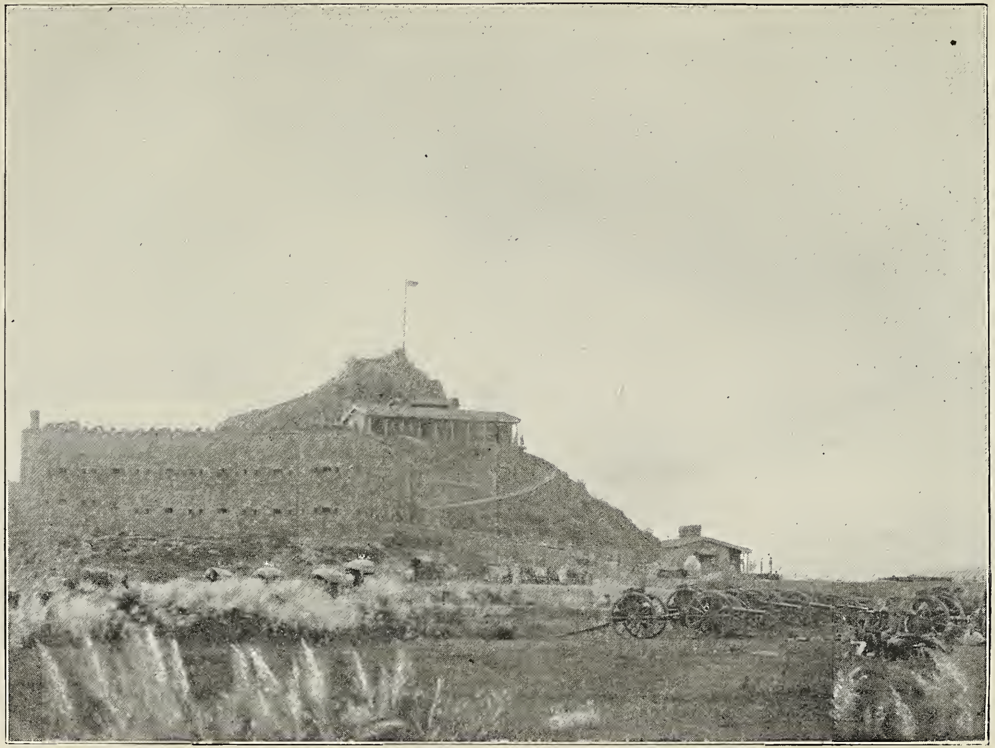
(Signed) H. B. Donne, Captain,
D.A.A.G., 3rd Brigade, M.F.F.

Supplement to R.A.I. "PROCEEDINGS," No. 12, Vol. XXVI.



CAMP OF THE 2nd BRIGADE MALAKAND FIELD FORCE AT NORTH MALAKAND.

From a photograph by Lieut. E. F. Delaforce, R.F.A.



GUN PARK OF 10th FIELD BATTERY, R.A.

UNDER THE WALLS OF CHAKDARA FORT.

From a photograph by Major C. A. Anderson, R.F.A.

General Sir Bindon Blood also telegraphed a very complimentary message to the Inspector-General of Artillery in India:—

TELEGRAM.

G.O.C. M.F.F. to I.G.A., Simla.

"I should like to invite your special attention to the achievements of Major Anderson and the 10th Field Battery. They did excellently at Landakai after overcoming obstacles which I confess at first sight made me doubt their success. Since then they have shown the most gratifying energy, resource and *esprit de corps*, in getting to the front in spite of every difficulty. They are now at Panjkora Bridge whence I am compelled to recall them, much to my regret, owing to difficulties about feeding their walers. I hope you will be able to keep them with me in further operations. Their presence with my force has been of the greatest value."

For about a month the Battery remained at Panjkora Bridge and the monotony of the situation was only relieved by mahseer fishing, which was obtainable on the spot and was distinctly good. Unfortunately two men lost their lives by drowing whilst bathing here. At the end of September, after the severe handling experienced by Brigadier-General Jeffrey's Brigade in the Mamund Valley, it was decided to take up the Battery to the Mamund Valley to assist in the punitive measures there. Accordingly the Panjkora river, which had been gradually falling, was forded, 2 guns and 4 wagons were left just over the ford, and 4 guns and 2 wagons went on and in 3 marches reached Inayat Killa, but to the regret of all, there was to be no more fighting there—peace was concluded—and so, after waiting about for some days for the submission of the various clans, the whole force returned, and recrossing the Malakand on 27th October, encamped at Jalala, to await developments. At Jalala a serious epidemic of influenza broke out among the horses, as many as 70 being on the sick list in one day. The division shifted camp to the banks of the Swat Canal, near Hoti Mardan, and here (there being an excellent water supply and much less dust) the horses more or less recovered, but very few escaped without suffering in condition. Christmas was spent in camp by most, but a few lucky ones managed to get away to Rawal Pindi for the festive season—26 miles by road and 3½ hours rail, only separating the two places.

On the 2nd January, 1898, the force became the Buner Field Force, the Bunerwals being the only tribe left to be dealt with, and everyone was delighted at the prospect of some more fighting, after the monotonous inactivity of the previous two months. Three marches took the force to the foot of the Tangi Pass into Buner, reached on the 6th January. The enemy could be seen in force on the crest of the pass.

On the 7th January the Battery moved out at the head of the column and advanced about 1000 yards nearer the pass and immediately came into action to cover the advance and very steep climb of the infantry. The Battery was in action for 4 hours and 50 minutes, and expended 476 rounds of Shrapnel. The fire was kept up over the heads of the infantry till they were within about 200 feet of the top—so steep was the ascent. After the action the Battery returned to camp and two days later marched to Rustam at the mouth of the Ambeyla Pass, through which it was proposed to bring out from Buner, the force that had gone in over the Tangi Pass. Nothing further happened, and on the 17th January the Battery was sent to Nowshera to await the breaking up of the force—eventually reaching Rawal Pindi by route march on the 29th January, after an absence of nearly six months.

The lecturer concluded by giving a résumé of the casualties that befel the Battery, and by describing briefly the equipment.

CASUALTIES.

MEN.

Total sent to Base Hospital	23

Of whom 5 were sent back to front and 3 were invalided home.

Deaths:—

Heat apoplexy	2
Drowning	2
Enteric fever	1
Total	5

HORSES.

Deaths:—

Heat apoplexy	11
Accident and disease	6
Total	17

The Battery was equipped with pole draught. No swingletrees were used. Nos. 4 and 5 always rode on off lead and centre horses. Carriages were of Mark II. pattern with drag shoe firing brakes. At the Tangi Pass the buffers and volute springs did not work well owing probably to the high angle of elevation at which the guns were firing. Case shot were found to be too weak to stand rough travelling. Black powder was employed. The limbers were of an experimental kind, 9-pr. converted to 12-pr. for pole draught.

2 axle-trees on limber were broken.

Wheels of gun carriages were of No. 42 pattern. Limbers No. 36 pattern. 7 felloes were broken (mostly across bosom).

1 slip felloe was used, and it lasted several months.

13 slip spokes were put in. All the ammunition boxes were greatly damaged. 20 new ones were supplied on returning to Rawal Pindi and 16 were repaired.

The lecturer expressed his thanks to Captain Ballard, R.F.A. for the use of his diary,* to Lieut.-Colonel C. A. Anderson for the greater

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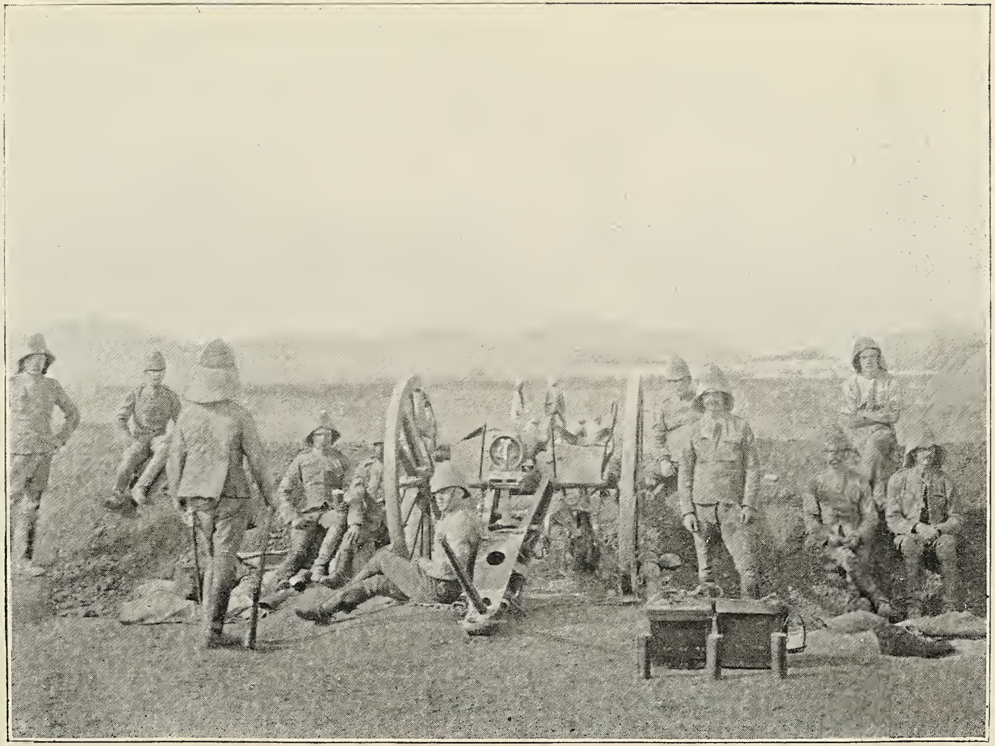
*R.A.I. "Proceedings," Vol. XXV., No. 8, "The Diary of the 10th Field Battery, R.A., with the Malakand Field Force." By Lieutenant C. N. B. Ballard, R.A.

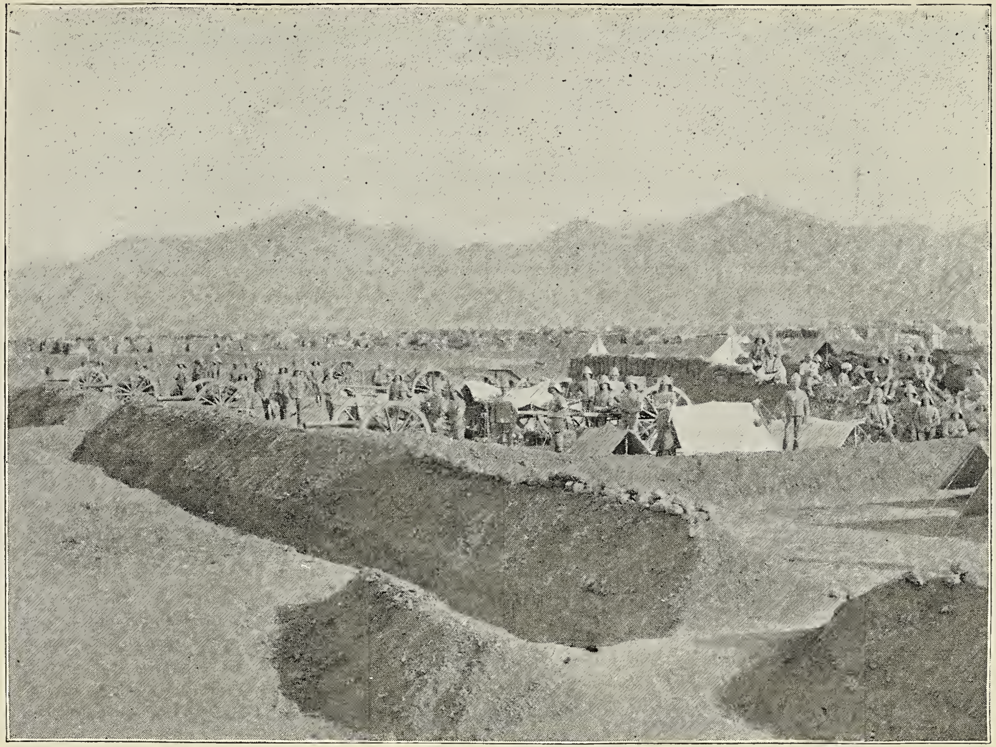


GUN PARK OF 10th FIELD BATTERY, R.A.

IN INAYAT KILLA ENTRENCHED CAMP (INSIDE).

From a photograph by Major C. A. Anderson, R.F.A.

Supplement to R.A.I. "PROCEEDINGS," No. 12, Vol. XXVI.



GUN PARK OF 10th FIELD BATTERY, R.A.

IN INAYAT KILLA ENTRENCHED CAMP (OUTSIDE).

From a photograph by Major C. A. Anderson, R.F.A.

part of the 42 photographs exhibited, and to Major Hobday for 4 of the excellent sketches out of his most interesting book, " Sketches on Service " (applause).

Major L. FORDE, R.F.A.:—Colonel Corbett, Officers and gentlemen, I think the narrative we have just heard from Mr. Delaforce has been so complete in detail that I cannot add anything as to the experiences of the Battery beyond what he has related.

I do not think however that one can ever go on service without gaining a good many impressions and learning a few lessons. I consider that we owe a very great debt of gratitude to the Commissariat from the fact, which Mr. Delaforce emphasised, of their supplying large quantities of ice to the regiments and batteries on the march up from Nowshera; I am quite certain that this issue saved hundreds of lives at every halting place when men were going down with heat apoplexy. In our Battery we had I think 23 or 24 cases and it was simply due to the liberal supply of ice that only two men died. One bad case was that of a gunner when we were halting during the day at Hoti Mardan whose temperature rose to 110, the highest that I have ever heard of and the doctor himself said that the man could not have lived ten minutes without the application of ice.

I think there are two chief lessons to be learnt from the use of Artillery in these two expeditions. The first is that it has opened the eyes of a good many to the mobility of the Field Artillery. From my experience there is a very prevalent idea that a Field Battery cannot travel over country very much rougher than a smooth plain, but the way in which the 10th Field Battery did manage to get over extremely difficult ground somehow or other, either by man handling, by the use of pick and shovel or by increasing the number of horses in each team proved what Field Artillery can do when commanded by a pushing and energetic officer and I think that Sir Bindon Blood fully acknowledged this.

The second lesson learnt from the use of Artillery is that guns enable infantry to assault what would otherwise be impregnable positions with a minimum loss to themselves.

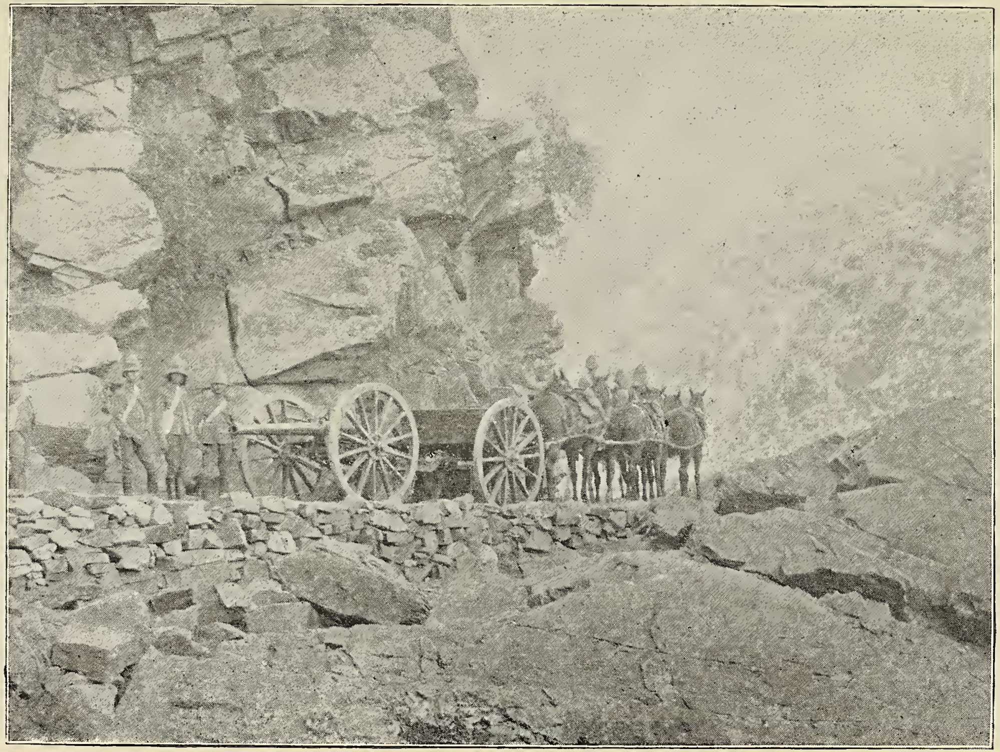
After every action it seems to me that the question of the physical effects of Artillery fire is always raised and not generally to the advantage of the guns. Well, speaking of the fight at Landakai, which is the only action in which I took part, I am decidedly of opinion that we did a great deal of damage, I think we must have. I do not believe that any battery could fire 132 rounds of time shrapnel, always at a taget (for we never fired unless we saw groups of the enemy) without killing or wounding some, and the enemy themselves admitted that they had suffered great losses from the Artillery fire alone. But, be that as it may, I do not think the butcher's bill is very important in comparison with the facilities that Artillery fire affords the infantry to attack an enemy posted on the crest of a precipitous spur. At Landakai the position of the enemy was from 550 to 800 feet above us, the climbing was very steep and the day was intensely hot. By the time the infantry reached the top the ridge had been practically cleared by the guns, judging by the number of shots fired. The amount of resistance met with may be gauged by the fact that our casualties among the infantry amounted to only 5 wounded. I think therefore that quite the most important part played by the Artillery in all these frontier campaigns is that nearly all positions were cleared beforehand by the guns.

Captain C. N. B. BALLARD, R.F.A.:—I really think Mr. Delaforce has said everything there was to say, and I cannot think of anything further to say to you, gentlemen.

Major G. N. MAYNE, King's Own Scottish Borderers:—Colonel Corbett, Officers and gentlemen, Major Forde just now made a remark as to the great moral effect caused by the Artillery in helping the infantry to attack these positions. So far as we were concerned at Tirah, the Battery that we saw the most of was No. 5 Mountain Battery, under the command of Captain, now Major, Money, and I will say one thing that, although it seems to be the general impression that Mountain Artillery are not strong enough as regards their shell fire, at the same time I may tell you we received very considerable help from that Battery, No. 5, on several occasions, and especially in retirements from positions. I do not know very much about the technical part of the Artillery, and so I do not think I can add anything more to the discussion, except to say that just as we were concentrating at Shinwari, the starting point of the Tirah Expedition, we met a Field Battery returning to India. It must be evident to all who have heard Lieut. Delaforce's very interesting lecture that this Field Battery might have been very usefully employed during the two attacks on the Dargai Heights, and would certainly have caused considerable loss to the enemy and greatly aided our troops in carrying that extremely difficult position.

The CHAIRMAN:—I think gentlemen, we have got to thank the lecturer very much for the interesting lecture that we have heard. I do not wish to say much myself, but there are just one or two points which have been mentioned, on which I might say something. The first is as regards what we have heard about the effect of Artillery fire in these mountainous places. No doubt the Artillery is acting under very great disadvantages; you are firing up, as we were told, between 15 and 17 degrees, and the enemy you are firing at are on a narrow ridge; so that, if your shell does not exactly hit the right place, it does not hurt them a bit; if it is a little bit too low it cannot reach right up, for the slopes are too steep, so it simply hits the mountain and breaks; and, if it is a little too high, it goes bang over and cannot hurt anybody. But the most important thing is that it keeps the enemy from the crest of the hill, and therefore they cannot fire at the infantry storming the place; and I think that is *the* important thing as regards the Artillery in country of that sort. Whether they kill many or few, is a comparatively small matter, though, of course, the more they kill the better; but the great thing is that it keeps the enemy away, so that they cannot lean over and shoot down at the infantry as they are climbing up the slopes, and it therefore enables the infantry to get very near to the top before the enmy can fire at them.

There is only one other point I should like to mention. Major



GUN OF 10th FIELD BATTERY, R.A.

ON CAUSEWAY ALONG EAST BANK OF PANJKORA RIVER.

From a photograph by Major C. A. Anderson, R.F.A.

Forde said the experiences of this campaign show what a Field Battery could do, and that there was an idea that they could only go over comparatively smooth places. It is only the old lesson learnt over again. During the Afghan War with which I had a good deal to do, we showed them the same at that time (loud applause). But that is a good time ago, and it is just as well that those lessons should be repeated from time to time, and that everybody should know and remember the power of mobility that our Horse and Field Artillery have.

I will not say anything more except to ask you to join in a vote of thanks for the very interesting lecture that we have heard (loud applause).

Lieutenant E. F. DELAFORCE, R.F.A.:—I should just like to make one remark with reference to the damage done by the Artillery fire, which has been referred to. From enquiries made by the Political officers, when peace was restored, from the different tribes, as to the actual damage done at Landakai, it was ascertained that 450 men were killed mostly by shell fire. The men retired down the reverse slope thinking they would there be safe and that the shelling would soon be all over, and that they could then rush out on the infantry as they came up; but, in this they were mistaken; one section of the Bunerwals, 100 strong, lost 70 men in some sangars which were drawn back somewhat from the actual crest. That shows that the shell were not altogether wasted.

I must thank you very much indeed for your kind reception of my lecture (applause)

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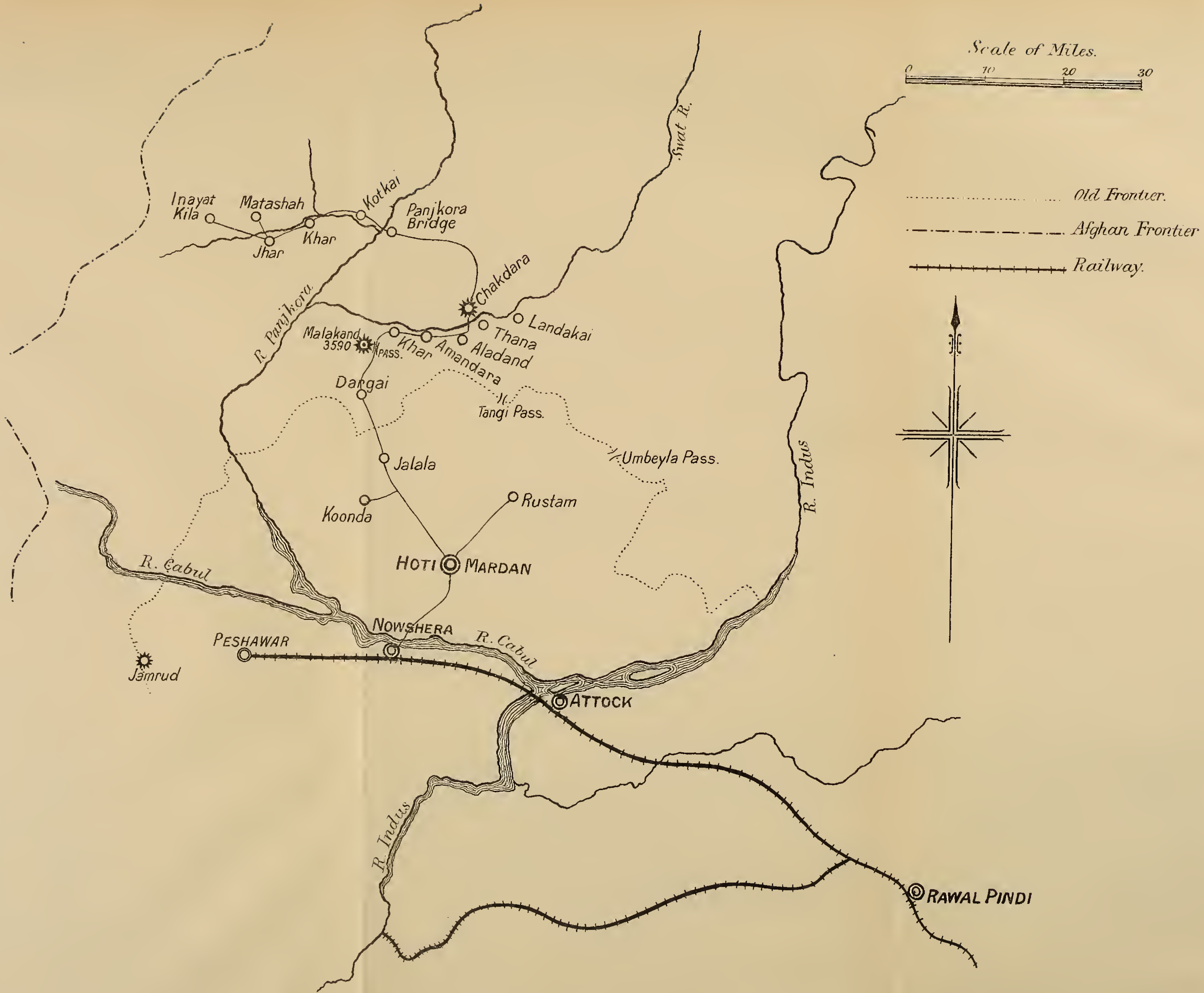

Supplement to "THE 10$^{\text{TH}}$ FIELD BATTERY, R.A. in the MALAKHAND & BUNER EXPEDITIONS, 1897-8."
A Lecture by Lieut. E. F. Delaforce R.A.; "Proceedings" R.A.I., Vol. XXVI. N$^{\text{os}}$ 11 & 12.

THE COLLECTION OF WAR MEDALS IN THE ROYAL ARTILLERY INSTITUTION.

BY

CAPTAIN G. F. MACMUNN, *D.S.O.*, R.A.

OLD war medals being a hobby of mine, I spent an afternoon a few weeks ago looking over the medals in the R.A. Institution and was much struck with the extremely interesting and in many cases rare medals in the Museum. Major Boileau was kind enough to allow me to overhaul them, and they afforded me so much pleasure, that an account of them and the old world memories they recall may be of interest to readers of the "Proceedings." The gem of course is the special Robe collection prsented by Miss Vimiera Robe, being the various medals and orders of her father, Colonel Sir William Robe, K.C.B., K.C.H., K.T.S., R.A., and brother, Lieutenant William Livingstone Robe, R.H.A. They include a General officers gold Peninsula cross, with clasp "Busaco," a gold medal for Vimiera, a gold medal with clasp for Nive, the collar and badge of the Bath, the cross and star of the Guelphic Order of Hanover, and a Waterloo medal. These orders rightly occupy a special case and place of honour by themeslves.

The main collection in the large case, consists of presentations by various officers and purchases of notable regimental medals by the Institution.

These are now arranged more or less chronologically and the finest group of twelve medals collected by Captain Buckle of the Bengal Artillery to illustrate his "Memoir of the Services of the Bengal Artillery," and were presented to the Institution by his son, then Lieutenant Buckle, R.A. They consist of eight of the quaint silver medals presented by "John Company" to its own troops, and are for services in Java, 1811, Bourbon, and the Mauritius, 1809-10, Mysore, 1791-2, Ceylon, 1795-6, Egypt, 1801, Capture of Seringapatam, 1799, Wellesley's Capture of Ahmednagar, 1803 (this is a doubtful one which I hope to verify later, it being almost effaced),* and lastly a very fine English struck medal for the 1st Burmese war of 1824-6. Most of these medals are a trifle larger than a crown piece, and portray on the obverse various scenes in the campaigns for which they were bestowed, with interesting figures of old time sepoys. The Burma medal is of the ordinary medal size, and on the *obverse* is the white elephant "Kowtowing," or more correctly "Shikowing" to the British lion. The *reverse* has a magnificent scene of an army occupying the surroundings of the Shwé da gone Pagoda.

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* The descriptive card placed in the case with the Buckle collection states that this medal is supposed to be given for the capture of Ahmedabad in 1780.—Secretary R.A.I.

The Seringapatam medal was given by the company to Kings troops also, but I cannot find that this was done in the case of the others. This medal has a very fine die, though the Institution specimen is much rubbed. The obverse represents the British Lion sending the Tiger of Mysore flying, with a blow from the shoulder, while the *reverse* shows thousands of troops pressing with their ladders to the storming of the fortress. In a new specimen every detail is most clear, and the engraving of the die a marvellous piece of work. The Company's medals were mostly worn with a yellow ribbon, but later orders directed the "Military War Ribbon" as for Waterloo, the Peninsula, etc. to be worn with the Seringapatam medal. I was very fortunate myself in picking up lately a "cased" specimen of this medal, with an original bit of yellow ribbon attached, the medal being mint new.

The Egypt medal is of interest for it is often forgotten in talking of Indian contingents to Egypt and South Africa in our days, that in 1801 a very smart force of British and Bombay Native regiments landed in Egypt, and marched from a point on the Red Sea to Cairo. The expedition was under the command of Sir David Baird. The H.E.I. Company bestowed its medals on its natives promptly, but their British officers and the King's Troops in Egypt did *not receive their medals till 1848*, when they received "the war medal" with clasp for "Egypt 1801." Truly times are changed, and Egypt is more fruitful now than then It is also interesting to remember that this Indian contingent went to fight the French, and that then we had no qualms about pitting black troops against white when occasion demanded.

Next to these in chronological order, we have medals for wars with the French. These consist of the "Military War Medal" often erroneously called the "Peninsula" medal, given for various campaigns and expeditions the world through, during the wars with the French from the Revolution up to 1814, a period of 25 years. This medal has only 28 clasps all told, and *was not awarded till 1848*, the clasp for "Egypt 1801" already referred to being one. The Duke of Wellington had set his face it is said against war medals, as tending to demoralize the high spirit and traditions of the service, and it was only after a long fight by the military members of Parliament, after the award of medals for the Afghan campaigns of 1838-42, the Gwalior campaign of 1843 and the Scinde and Sutlej campaigns that this medal was granted *fifty years overdue in some cases.*

The Institution has two specimens of this medal, one that of Gunner Rollands, recently purchased *with thirteen* clasps, an almost unique number, and one with three clasps. Gunner Rollands clasps are: Nive, Nivelle, St. Sebastian, Pyrenees, Vittoria, Salamanca, Badajoz, Ciudad Rodrigo, Fuentes D'Onor, Busaco, Talavera, Vimiera, and Roleia.

The collection also includes a very rare Rocket Troop medal inscribed "Vittoria" and "Leipsic." This troop was the only British corps present at Leipsic and very greatly distinguished itself.*

Another thrice overdue medal awarded at the same time as "The Military War Medal" was the "Naval War Medal" foı services including all the wars with the French, including Trafalgar and the Nile and extending to Navarino and the capture of St. Jean D'Acre.

Of this the collection has one specimen with clasp for "St. Domingo." The number of clasps with this medal were very numerous. It is identical in design and shape with the military medal, save for the reverse, which has Britannia riding a sea-horse, while the army medal bears a representation of Wellington being crowned with a laurel wreath. The ribbon of the Naval medal is white with blue edges, while the Army medal is worn with the "Military War Ribbon," crimson with blue edges, and is used for the Waterloo and Seringapatam medals also and the various Peninsula gold crosses. Thus in those days several medals could be worn with identical ribbons

We now come to the closing episode of the wars with the French, for which a medal was given in 1816, inscribed "Waterloo" with the Regent's head on the obverse. Apparently public feeling overcame the Duke's dislike to medals in this case. The collection contains two Waterloo medals, and also one "Hanoverian" one viz. a medal given by Prince George Regent to his faithful Hanoverian Troops who so fully bore their share that day. We are apt to forget that the Guelph Kings of England were electors of Hanover, and that Britain took the Hanoverian Troops into their pay to fight Napoleon. This particular specimen of Hanoverian medal was picked up by Captain J. C. Dalton, R.A. (now Colonel Dalton) on the continent and presented to the Institution in 1881. The design differs somewhat from the British medal.

The collection includes three medals belonging to this epoch, which though they are not official are rare and interesting. Seeing that Government took no steps to reward their sailors after the Nile, and Trafalgar, two private individuals, Mr. Davidson in the case of the Nile and Mr. Boulton for Trafalgar, presented all ranks with medals. The Institution has a gilt pewter Nile medal (petty officer's) and a bronze one, (seaman's) and a pewter (seaman's) Trafalgar medal.

The next in order of date is a Turkish medal given in various metals for the capture of St. Jean D'Acre (1833) it is a very small medal and the copy we have is copper silvered over.

We now come to the "first India medal" worn with a plain "Cambridge" blue ribbon. It had 21 clasps including Assaye, Laswari, Capture of Delhi, Defence of Delhi, Gawilghur, Poona, Kirkee, Aseerghur, Koregaon, Nepaul, Bhurtpoor, Ava, etc., and covered the wars of close on 35 years. It was also given at the same time as the belated Army and Navy medals referred to. The Institution specimens bears clasp for "Ava," or the first Burmese War in 1823, and goes with the H.E.I.C.'s medals for Burma in Captain Buckle's collection.

The next series of medals is four more of Captain Buckle's, for the first Afghan wars. First the "Kelat-i-Ghilzai" medal, with the motto "Invicta" for the celebrated defence of that place by what is now the 12th Bengal Infantry (Kelat-i-Ghilzai Regiment). This is a very rare and valuable medal. Next three varieties of what is known as the "Victoria Vindex" series, because they bear that inscription instead of "Victoria Regina," and were awarded to the avenging armies of Generals Nott and Pollock advancing from Kandahar and Peshawur. (This latter was the first Artillery officer to command an Army). For those medals, clasps were not granted, and they are inscribed, "Candahar-Ghuzni, Kabul," "Ghuzni-Cabul," and "Candahar," according to the actions in which the recipient took part. The Institution has a duplicate of the "Ghuzni-Cabul" medal. The Afghan medals were all worn with the rainbow ribbon like that of the Star for Lord Roberts' March, but wider. This by the way is not a rainbow ribbon, but represents the rising sun, and was designed by Lord Ellenborough, the then Governor-General of India, he of the Gates of Somnauth* memory. The ribbon was known as the "Military ribbon of India," and was also worn with the medals for Sir Charles Napier's campaigns in Scinde, and the bronze star for Lord Gough's Gwalior campaign in 1843. The next Indian medal was for the first Sikh War or Sutlej campaign in 1845, of which the Institution has no specimen, but the Panjab campaign of 1849 is represented by the medal with clasp for "Goojerat."

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* Now "O" Battery, R.H.A.

The next group in the collection is that representing the decorations received by British officers or men for the Crimea, and consists of a Crimean medal with four clasps, "Alma," "Balaclava," "Inkerman" and "Sebastopol," a fine trophy, a Turkish medal as given to the British, and a Turkish medal as given to the Sardinians, an Order of the Medjidie of the 3rd class, and the handsome French medal for "Valeur et discipline," a distinguished conduct medal in some sort.

The difference between the Turkish medals is ingenious. The die represents a trophy of the flags of the allies, British, French, Turks and Sardinians, the flag of the nation of the recipient being on the right of the Turkish flag. Thus the British received a medal with our flag on the right and so on, the Institution having the British and Sardinian ones.

Some of our officers received the Sardinian War medal besides, so that fortunate individuals would wear six or seven decorations for that campaign. The Legion of Honour was also granted to some.

The collection includes two specimens of the second Indian Medal (of 1854), that of the ribbon with red and blue stripes, first given for the second Burmese War in 1853. These two specimens have clasps "Persia" and "Burma, 1885-87." There are no specimens of the Mutiny medal or of those of the last Afghan War.

This second India medal ended after the "Waziristan Expedition of 1894-5," with 21 clasps in all, and the third India medal was inaugurated by the Chitral campaign and has already six clasps.

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* In 1842 the victorious British Army brought back from Ghuzni to India the gates which were said to be those of the temple of Somnauth carried off by the Mohammedans 800 years before. Lord Ellenborough thought their restoration would be a gratifying and conciliatory act towards the Hindoos but as a political measure it appears to have been of doubtful value, especially as the gates proved to be not genuine.—Secretary R.A.I.

Of the China medals there are two specimens, one with clasps for "Pekin" and "Taku Forts," one with clasp for "Pekin" alone. These are for the 1857-60 wars, and not the first China War of 1840, which received a similar medal, but without any clasps.

The Institution has two specimens of the South African medal with clasps for "78-79" and "77-8-9." This medal was first given in the fifties for many years of Kaffir Wars without a clasp. In the campaigns of 77-8-9 only one clasp was granted, bearing the years as the case might be, a little hard on those who went through the whole thing.

This closes the list of actual British war medals in the Institution Museum, but there is also the hexagonal medal for 'Arctic discoveries," and the old and new patterns of the Long Service and Good Conduct medal, and also the corresponding naval medal, called in the Navy the "Long Conduct" medal!

The collection includes also a *replica* of Cromwell's medal to his troops for the Battle of Dunbar.

In addition to all these medals there are many bronze and a few silver foreign war medals and decorations, chiefly Prussian and Russian and not of very great interest to English folk in general. These with many of the British medals were presented to the Institution by Colonel N. L. Walford, R.A.

It will be noticed that the Institution collection is not at all a complete one, many famous medals being unrepresented, and is rather the result of presentations from various officers, than of an intention to collect specimens of all British medals, though the Institution is always on the look out for notable medals bestowed on gunners, as in the case of Gunner Rolland's medal that may come into the market. The Institution medal collection would be a very suitable sanctuary for those who wish to place heirlooms of this kind in safety.

Though the collection is not complete, it contains some very rare ones commanding very high prices as curios, most especially the eight medals of John Company, some of which are now quite unobtainable, while Gunner Rolland's medal with 13 clasps is very valuable.

The reason the Company's medals are so scarce, is that having been given largely to Native troops, they were all melted down in the bad famines in by-gone days in Bengal and Madras, not so much by the recipient who valued them, as by their widows and children in time of need.

A LIST OF THE MEDALS IN THE ROYAL ARTILLERY INSTITUTION.

THE ROBE COLLECTION.

1. General officer's gold Peninsula cross.—clasp "Busaco."
2. Gold medal for Roleia, Vimiera and Talavera.
3. „ „ for Nivelle.—clasp "Nive."
4. Collar and badge of a Knight Commander of the Bath.
5. Cross and star of a Knight of the Guelphic Order of Hanover.
6. Order of the Tower and Sword of Portugal.
7. Silver Medal for Waterloo.

THE GENERAL COLLECTION.

1. H.E.I.C.'s Medal for Mysore, 1791-2
2. „ „ Ceylon, 1795-6.
3. „ „ Seringapatam, 1799.
4. „ „ Egypt, 1801
5. „ „ Capture of Ahmednagar, 1803. Doubtful
6. „ „ Bourbon and Mauritius
7. „ „ Java, 1811.
8. „ „ Burma, 1824-26.

all unnamed—part of the Buckle collection.

9. Peninsula medal.—13 clasps.—Gunner Rollands, Royal Artillery.
10. „ „ 3 clasps.—Named 16th Light Dragoons.
11. Waterloo medal.—Named Grenadier Guards.
12. „ „ Dr. Singleton, R.H.A.
13. Hanover Waterloo medal.—Named Grenadier Battalion.
14. Naval medal.—1 clasp.—Named.
15. Leipsic and Vittoria.—Rocket Troop.
16. Boulton's Trafalgar medal.
17. Davidson's Bronze Nile medal.
18. „ Pewter gilt Nile medal.

Unnamed.

19. Afghanistan, 1841-2.—Candahar.—Unnamed.
20. „ Ghuzni-Cabul.—Br. O'Neil, 3 Coy.
21. Afghanistan.—Candahar, Ghuzni, Cabul.—Unnamed. 2 Batt. Bengal Ft. Arty.
22. Afghanistan.—Kelat-i-Ghilzai.—Unnamed.

part of the Buckle collection.

23. Ghuzni Cabul.—Unnamed.
24. First India.—Clasp for Ava.—Named 41st Foot.
25. Panjab medal.—Clasp for Goojerat.—Named 1st Bengal Fusiliers.
26. 2nd China War.—Two clasps.—Named 1st Battalion 2nd Foot.
27. „ „ One clasp.—Gr. Potter, 4th Battery, 9th Brigade, R.A.
28. Second India medal.—Persia.—Named 2nd Bombay Eur. L.I.
29. „ „ Burma, 1885-7.
30. South Africa, 78-79.—Named 90th Foot.
31. „ „ 77-8-9.—Named 1st Battalion 13th Foot.
32. Crimea.—4 clasps.—Driver Brake, R.A.
33. Turkish to British.—Unnamed.
34. Turkish to Sardinians.—Unnamed.
35. French for "Valeur et discipline."—Unnamed.
36. Medjidie.—Unnamed.
37. Turkish medal for Acre, 1833.—Unnamed.
38. Arctic medal.
39. Army Long Service & Good Conduct, old.—Gr. and Dr. Ralf, RA .

40. Army Long Service and Good Conduct—new pattern.—Gr. Ford, 4th Bde. R.A.
41. Navy Long Service and Good Conduct.—Named Marines.
42. Cromwell's Dunbar medal *replica.*

Various foreign medals, including several for the wars of 1812-13-14, during the final struggles of Napoleon.

NOTE.—The Committee have tendered a vote of thanks to Captain MacMunn for his labours in having arranged, ribbonned, and catalogued the R.A. Institution's medals. Captain MacMunn is a numismatist and collector himself, and the Committee consider themselves fortunate in having obtained his services. The medals used to be scattered about the building but are now collected in one large show case placed vertically on the wall of the Reading Room The Robe collection still remain in their own case in the Smoking Room. The Committee will be very grateful to members or friends of the Institution who will supply any of the medals wanting to complete the collection either as gifts or deposits on loan.—Secretary R.A.I.

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FROM

CORRESPONDING MEMBERS.

"DUNCAN" GOLD MEDAL PRIZE ESSAY, 1899.

THE Subject approved for the "Duncan" Gold Medal Prize Essay, 1899, is as follows:—

"The technical training of officers in Garrison Artillery."

The Rules for the Prize Essays now read:—

The Annual Gold Medal, when awarded, to be accompanied by an *honorarium* of £20; the Silver Medal by an *honorarium* of £10.

The candidates must be Officers of the Regiment who are members of the R.A. Institution.

Officers are requested to confine their Essays to about 16 printed pages of the "Proceedings" other things being equal, brevity will count towards success.

The Essays must be forwarded to the Secretary so as to reach him on or before the 1st of April

Each Essay must be *type-written* in triplicate. The Essays must be strictly anonymous, but each to have a motto, and be accompanied by a sealed envelope with the motto written outside and the name of the writer inside; further, if the writer wishes to recover from the Committee part of the cost of type-writing his Essay he should state this fact in the same sealed envelope and write outside it, above the motto, "to be opened."

All the envelopes thus marked will be opened by the Secretary after the result of the comptition has been announced, and he will send the writers the money for their type-writing expenses.

The Committee will allow a sum of £1 for type-writing each Essay.

The Essays will be submitted for decision to three Judges chosen by the Committee.

The Judges are empowered to recommend:—

1. That two Medals, one Gold and one Silver, be awarded, or
2. That only one Medal, Gold or Silver, according to the merit of the Essay, be awarded, or
3. That no Medal be awarded.

The names of the successful candidates will be announced at the Annual Meeting, and Medallists will be distinguished as such in all Lists, &c., issued from the Institution, and in the event of a University man gaining a Medal, a report of his success will be made to the University of which he may be a member.

The successful Essays will be printed and circulated to members by the Institution.

N.B.—The Committee draw particular attention to the paragraph in the Rules above on the subject of length of Essays; it is not difficult to discover the number of words in an average page of "Proceedings" matter, and so to keep an Essay within the 16 pages' limit.

THE following works are now on sale at the R.A. Institution and will be forwarded post free at the prices noted after their titles below:—

"Twenty-four hours of Moltke's Strategy" by Fritz Hoenig. Translated by Colonel N. L. Walford, price 5s.

"The Shrapnel Fire of the Field Artillery" by Major-General Rohne. Translated by Colonel N. L. Walford, price 2s. 6d.

Major-General Stubbs's "List of Officers of the Bengal Artillery," price 5s. 3d.

"Field Artillery Fire," by Captain W. L. White, R.A., price 1s. 2d.

"Ranging Note-Book," by Captain S. W. Lane, R.A., price 1s. 1d.

"Achievements of Field Artillery," by Major E. S. May, R.A., bound, price 2s. 6d.

"The Value of Mobility for Field Artillery," by Major E. S. May, R.A., paper covers, price 3d

"The Young Officer's 'Don't,' or Hints to Youngsters on Joining," by an Officer R.A., price 7d.

Examination questions in (*c*), (*d*), (*e*) and (*g*) set in the five examinations ending November 1897:—

Captains (*c*), (*d*) and (*g*) ...	price 1s. 1d.
Lieutenants (*c*), (*d*), (*e*) and (*g*)	price 1s. 1d.

Tables of Four-Figure Logarithms, pocket edition, mounted on linen, price 3d.

"Notes on the early history of the Royal Regiment of Artillery," by the late Colonel Cleaveland, R.A., price 2s.

"Ballistic Tables with an explanation," by A. G. Hadcock, late R.A., price 5s. each, subject to a large discount to members of the R.A.I.

"The Retreat from Moscow and passage of the Beresina," by Major-General A. E. Turner, C.B., price 2s. 6d.

"THE RETREAT from Moscow and passage of the Beresina," by Major-General A. E. Turner, C.B., has been reprinted from Vols. XIV. and XV. *United Service Magazine*, in which it originally appeared. A limited number of copies are on sale at the R.A. Institution.

WOOLWICH

ON TUESDAY, 29th Nov., 1898, a discussion was held at the R.A. Institution, on the "Artillery used in the recent campaigns in Egypt" (Atbara and Omdurman.) Lieut.-General Sir Henry Brackenbury, K.C.B., K.C.S.I,. took the chair at 3 p.m., and the various officers who had served with batteries in these campaigns were in turn invited to give their experiences. There was a very large attendance of officers of all arms, both from Woolwich and out-stations. The discussion terminated at about 5.30 p.m.; a verbatim report thereof will, in due course, appear in the "Proceedings" R.A. Institution.

ON THURSDAY, 1st December, 1898. Major A. J. Abdy, R.A., was entertained at dinner at the R.A. Mess on vacating the appointment of Secretary to the R.A. Institution and prior to embarking for India to assume the command of the 53rd Field Battery at Deesa. Colonel R. Corbett, in proposing his health, referred to the great services which Major Abdy had rendered to the Institution—a sentiment which will be thoroughly endorsed by all members of the R.A. Institution throughout the Regiment.

ON THURSDAY, 8th December, Lieut.-Colonel W. H. H. Waters, M.V.O., R.A., delivered a most interesting lecture on his 5 years experiences in Russia and Siberia, entitled the "Trans-Siberian Railway." Major-General J. F. Maurice, C.B., took the chair. Some forty or fifty officers and a few ladies were present. The lecture will be printed in the "Proceedings" R.A. Institution in due course.

List of additions to the Library during the month of December, 1898.

PRESENTED.	BY WHOM.
Queen's Regulations, 1898. (6 copies) ...	Secretary of State.
Army School Regulations, 1898	
Priced Vocabulary of stores, 1898.	
Handbook of the Military Forces of Russia. 2nd Edition, 1892. (2 copies).	
The Annual Statistical and General Report of the Army Veterinary Department, 1898.	
Map of India between Calcutta and Lahore, 1857	Major-Gen. J. B. Dennis.
Rules for the information and guidance of officers arriving with European troops. Calcutta, 1858	
Field exercise and evolutions of infantry, 1861	
Manual and platoon exercises for percussion carbines, 1851	
Romanized School Dictionary; English and Urdu. Calcutta, 1856	
English and Oordoo Dictionary. Calcutta, 1852	
Handbook to Hindoostanee conversation. Serampore, 1859	
Forbe's Hindustani Manual (MS.)	
Manuscript work on Artillery (circa 1755)...	Colonel J. C. Dalton, R.A.
Minutes of 'Proceedings' of the Institution of Civil Engineers. Vol. CXXXIV. ...	The Council.
Record of transactions of the Institution of Junior Engineers. Vol. VII., 1896–7.	
Handbook of artillery *matériel*; by Lieut.-Col. F. C. Morgan, R.A. 6th edition. ...	The Author.
Mapa Militar de los Ferrocarriles de España. (4 sheets)	Lieut.-Col. J. Rivera.

Museum.

3 glass cases containing stuffed birds	Mrs. Whitely.
1 ,, case ,, ,, Kangaroo ...	
1 ,, ,, ,, ,, fish	
2 stuffed water birds.	
1 Knob Kerrie.	
1 Basket made of coloured grass	

PURCHASED.

Crecy and Calais; by Major-General the Hon. Geo. Wrottesley.

Kriegsgeschichtliche Beispiele aus dem Deutsch-Französischen Kriege von 1870-71. Part 10.

English Army Lists and Commission Registers. Vol. IV., 1694-1702.

Stonewall Jackson and the American Civil War; by Lieut.-Colonel G. F. R. Henderson. 2 vols., 1898.

Navy Record Society's Publications, Vol. XII., Part 2, 1898. "Admiral of the Fleet, Sir Thos. Byam Martin, G.C.B."

OBITUARY.

MAJOR-GENERAL C. V. BOWIE (retired) whose death occurred at Bath, 30th Nov., 1898, joined the Bengal Artillery as 2nd Lieutenant, 10th December, 1841; became Lieutenant 3rd July, 1845; Captain 20th January, 1856; Brevet-Major 22nd January, 1856; Lieutenant-Colonel 15th June, 1862; Colonel 7th October, 1868 and retired with the hon. rank of Major-General 1st August, 1872. General Bowie served during the Sutlej Campaign, 1845-6, including the battles of Moodkee (slightly wounded) Ferozeshah and Sobraon. Punjab campaign. Attack on the Residency at Peshawar by the Sikh troops, where he was taken prisoner by the Afghans and afterwards by the Sikhs, (medal). He was A.-D-C. to the Governor-General of India from 1849-56 and Military Secretary from 1856-62.

CAPTAIN H. CALLEY died at Meerut, 24th November, 1898. He was first commissioned as Lieutenant 26th July, 1881 and became Captain 29th March, 1890.

MAJOR GENERAL L. H. DENNE (retired) died 13th December, 1898. He joined the Regiment as 2nd Lieutenant 19th December, 1848; became Lieutenant 2nd May, 1849; 2nd Captain, 23rd June, 1855; Captain 26th January, 1862; Major 9th April, 1871; Lieutenant-Colonel 4th February, 1874; Colonel 13th February, 1881 and retired with the hon. rank of Major-General 7th September, 1881. General Denne served during the Crimean Campaign and was present at the Siege and Fall of Sebastopol; (medal with clasp and Turkish medal.)

LIEUTENANT A. O' C. SCOTT, who died at Hythe, 22nd November, 1898, was first commissioned as 2nd Lieutenant 14th February, 1890 and became Lieutenant 14th February, 1893, At the time of his death he held the appointment of Assistant-Inspector Lagos Constabulary.

LIEUTENANT-COLONEL F. M. E. VIBART (retired) whose death is announced as having occurred on 28th November, 1898, joined the Royal Artillery as Lieutenant 10th July, 1867; became Captain 19th February, 1879; Major 7th November, 1884; Lieutenant-Colonel on half-pay 7th November, 1891 and retired on retired pay 20th February, 1892. Lieutenant-Colonel Vibart served during the Zulu Campaign 1879-81; (medal with clasp); Transvaal Campaign; Burmese Expedition, 1886-7; (despatches, *London Gazette*, 2nd September, 1887—medal with clasp).

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1887—me

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